

101.1115-4320-222-15/990

TM 5-4320-222-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, FIELD AND
DEPOT MAINTENANCE MANUAL

PUMP, RECIPROCATING:
DIAPHRAGM; GASOLINE DRIVEN;
WHEEL MOUNTED, RUBBER
TIRES' 4 IN.; 100 GPM AT
10 FT. SUCTION LIFT

(RICE PUMP AND MACHINE CO. MODEL 4D-327)

FSN 4320-829-8434

LESS MIL STD ENGINE

RETURN TO GOV. DOCS. CLERK

This copy is a reprint which includes current
pages from Changes 1 through 4

HEADQUARTERS, DEPARTMENT OF THE ARMY

APRIL 1962

SAFETY PRECAUTIONS

Before Operation

If the pump is used in an inclosed area, exhaust gases must be piped to the outside. Exhaust gases contain carbon monoxide, a colorless, odorless, and poisonous gas.

When filling the fuel tank, always provide a metal-to-metal contact between the container and the tank. This will prevent a spark from being generated as fuel flows over the metallic surfaces.

During Operation

Do not fill the fuel tank while the engine is in operation. Gasoline spilled on a hot engine may explode and cause serious injury to personnel.

Do not operate the pump in an inclosed area, exhaust gases must be piped to the outside. Exhaust gases contain carbon monoxide, a colorless, odorless, and poisonous gas.

Make sure the spark plug leads are disconnected before doing any work on the reciprocating pump.

After Operation

Make sure the spark plug leads are disconnected before doing any work on the reciprocating pump.

Changes in Force: C1, C2, C3 and C4

TM 5-4320-222-15
C 4

CHANGE

NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 24 October 1986

Operator , Organizational, Field and Depot
Maintenance Manual

PUMP, RECIPROCATING: DIAPHRAGM;
GASOLINE DRIVEN; WHEEL MOUNTED,
RUBBER TIRES 4 IN.; 100 GPM AT
10 FT. SUCTION LIFT
(RICE PUMP AND MACHINE CO. MODEL 4D-327)
FSN 4320-829-8434
LESS MIL STD ENGINE

TM 5-4320-222-15, 3 April 1962, is changed as follows:

Page 59. Reference Maintenance Allocation Chart, Functional Group 0100, Overhaul,
delete the "X" in column 5 and insert an "X" in column 4. Delete Remarks.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-25A, Operator, Organizational,
Direct Support and General Support Maintenance requirements for Pump, Reciproca-
ting, Diaphragm, Gas Driven, Wheel Mounted, 100 GPM, 10 FT Lift, 4 IN (4D-327)
(TM 5-4320-222 Series)

Changes in Force: C 1, C 2, and C 3

**TM 5-4320-222-15
C 3**

Change }
No. 3 }

**HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 18 April 1973**

Operator's, Organizational, Direct Support, General Support, and Depot

Maintenance Manual

PUMP, RECIPROCATING: DIAPHRAGM;

GASOLINE DRIVEN; WHEEL MOUNTED,

RUBBER TIRES 4 IN.; 100 GPM AT 10 FT.

SUCTION LIFT

(RICE PUMP AND MACHINE CO. MODEL 4D-327) FSN 4320-

829-8434 LESS MIL STD ENGINE

TM 5-4320-222-15, 3 April 1962, is changed as follows:

Title is changed to read as shown above.

Page 19. Paragraph 11*e* is added as follows:

e. Maintenance and Operating Supplies. Maintenance and operating supplies required for the initial 8 hours of operation for the centrifugal pump are contained in table 2-1.

Table 2-1 is added as follows:

Table 2-1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required for initial operation	(5) Quantity required for 8 hrs operation	(6) Notes
0307 - TANK, FUEL	9130-160-1817	FUEL, GASOLINE: 5-gal can as follows: 91A	1 gal	2 gal	(1) Average fuel consumption is 0.25 gph of continuous operation.
1311 - WHEEL ASSEMBLY.		GREASE, AUTOMOTIVE AND ARTILLERY: 1-lb can as follows: GAA		(2)	(2) See current LO for grade application and replenishment intervals.
5505 - LUBRICATOR	9150-190-0904	OIL, LUBRICATING: 1 qt can or bulk as follows: Grade 9250 or OE-30.	1/32 qt	(2)	
	9150-231-6656	Grade 9110 or OE-10.	1/32 qt	(2)	
	9150-265-9433	OES	1/32 qt	(2)	
	9150-231-9040				
	9150-265-9425				
	9150-242-7602				
5509 - GEARCASE	9150-577-5844	OIL, LUBRICATING, GEAR: 5 gal drums as follows: GO-90	3/8 qt	(2)	
	9150-257-5440	GOS	3/8 qt	(2)	

Page 61. Appendix III is superseded as follows:

APPENDIX III

BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

1. Scope

This appendix lists basic issue items and items troop installed or authorized which accompany the pump centrifugal and are required by the crew/operator for operation, installation, or operator's maintenance.

2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List - Section II. Not applicable

b. Items Troop Installed or Authorized List - Section III. A list in alphabetical sequence of items which, at the discretion of the unit commander, may accompany the end item, but are not subject to be turned in with the end item.

3. Explanation of Columns

The following provides an explanation of columns in the tabular list of items troop installed or authorized, section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR); Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item which will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based; e.g., ft, ea, pr; etc.

e. Quantity Authorized. This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock number	(3) Description	(4) Unit of meas	(5) Qty auth
	7520-559-9618	CASE: Maintenance and operational manual.	ea	1
	4740-202-8653	HOSE ASSEMBLY OF COUPLING	ea	1
	2990-972-7950	ROPE STARTING	ea	1
	4210-555-8837	EXTINGUISHER, FIRE	ea	1

By Order of the Secretary of the Army:

Official:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-25A (qty rqr block No. 242), Organizational Maintenance Requirements for Pump, Fresh Water.

Changes in force: C 1 and C 2

TM 5-4320-222-15

C 2

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 21 June 1968

**Operator, Organizational, Field and Depot
Maintenance Manual**

**PUMP, RECIPROCATING: DIAPHRAGM;
GASOLINE DRIVEN; WHEEL MOUNTED,
RUBBER TIRES 4 IN.; 100 GPM AT**

10 FT. SUCTION LIFT

(RICE PUMP AND MACHINE CO. MODEL 4D-327)

FSN 4320-829-8434

LESS MIL STD ENGINE

TM 5-4320-222-15, 3 April 1962, is changed as follows:

Page 2. Paragraph 1c and 1d are superseded as follows:

c. DA Forms and records used for equipment maintenance will be only those prescribed in TM 38-750.

d. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP 4300 Goodfellow Boulevard, St. Louis, Mo. 63120

Page 3. Table 1. The "Source of Supply" column and entries therein are rescinded.

Page 47. Paragraph 66c line 3, "TM 9-200" is changed to read "TB 740-93-2".

Section II. LIMITED STORAGE. Wherever "AR 743-505" appears, it is changed to read "TB 740-93-3".

Paragraph 68c(4) line 3, "TM 9-2851" is changed to read "TM 9-213".

Pages 56 and 57. Appendix I, References is superseded as follows:

**APPENDIX I
REFERENCES**

1. Fire Protection

TB 5-4200-200-10

Hand Portable Fire Extinguishers for Army Users.

2. Lubrication

C9100-IL

Fuels, Lubricants, Oils and Waxes.

LO 502805-206-14

Engine, Gasoline: Military Standard (Models 1A08-1 and 1A08-2) 1-1/2 HP (and Models 2A016-1 and 2A016-2) 3 HP.

3. Painting

TM 9-213

Painting Instructions for Field Use.

4. Radio Suppression

TM 11-483

Radio Interference Suppression

5. Maintenance

TM 5-4230-222-25P

Organizational, Field and Depot Maintenance Repair Parts and Special Tool Lists, Pump, Reciprocating: Diaphragm; Gasoline Driven; Wheel Mounted, Rubber Tires, 4 In.; 100 GPM at 10 ft Suction Lift (Rice Pump and Machine Co. Model 4D-327) Serial Number Range 1120 through 1245 and 1346 through 1471, Less Mil Std Engine, FSN 4320-829-8434.

TM 5-2805-206-14

Operator, Organizational, DS and GS Maintenance Manual; Engine, Gasoline: Military Standard Models (Model 1A08-I) 1-1/2 (HP, FSN 2805-601-5181 (Model 1A08-II) 1-1/2 HP, FSN 2805-714-8552 (Model 2A016-I) 3 HP, FSN 2805-601-5127 (Model 2A016-II) 3 HP, FSN 2805-714-8553).

TM 5-2905-206-24P

Organizational, DS and GS Maintenance Repair Parts, Engine Gasoline, Military Standard Models, Model 1A08-1, FSN 2805-601-5181 Model 1A08-2, FSN 2805-714-8552, Model 2A016-1, FSN 2805-601-5127 Model 2A016-2, FSN 2805-714-8553.

TM 9-1870-1

Care and Maintenance of Pneumatic Tires

TM 38-750

Army Equipment Record Procedures

6. Shipment and Storage

TB 740-93-2

Preservation of USAMEC Mechanical Equipment for Shipment and Storage

TB 740-93-3

Administrative Storage of USAMEC Mechanical Equipment

Pages 61 thru 63. Appendix III, Basic Issue Items is superseded as follows:

APPENDIX III BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

Section II lists the accessories and publications required for operator or crew maintenance and operation that are initially issued with or authorized for the Reciprocating Pump.

2. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column (1). This col-

umn is divided as follows:

(1) Source code, indicates the selection status and source for the listed item. Source code is:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/D-SA or Army supply system, and authorized for use at indicated maintenance categories.

(2) Maintenance code, indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. *Federal Stock Number, Column (2).* This column indicates the Federal stock number for the item.

c. *Description, Column (3).* This column indicates the Federal item name and any additional description of the item re-

quired. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. *Unit of Issue, Column (4).* This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. *Quantity Incorporated in Unit Pack, Column (5).* This column indicates the actual quantity contained in the unit pack.

f. *Quantity Incorporated in Unit, Column (6).* This column indicates the quantity of the item used in the functional group.

g. *Quantity Furnished With Equipment, Column (7).* This column indicates the quantity of an item furnished with the equipment. Quantities indicated by an asterisk are to be requisitioned through normal supply channels as required.

h. *Quantity Authorized, Column (8).* This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk.

i. *Illustration, Column (9).* This column is divided as follows:

(1) *Figure number, column (9)(a).* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number, column (9)(b).* Indicates the callout number used to reference the item in the illustration.

3. Federal Supply Code for Manufacturer

Code	Manufacturer
81348	General Services Administration
97403	Army Engineer Research and Development Laboratories

Section II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal Stock No.	(3) DESCRIPTION	(4) Unit of Issue	(5) Qty inc in Unit Pack	(6) Qty inc in Unit	(7) Qty furn with Equip	(8) Qty Auth	(9) Illustration	
								(a) Fig No.	(b) Item No.
		GROUP 31—BASIC ISSUE ITEMS MANUFAC- Turer INSTALLED							
		3100—BASIC ISSUE ITEMS MANUFACTURER OR DEPOT INSTALLED							
PC	7520-559-9618	CASE, MAINTENANCE AND OPERATIONAL MANUAL: cotton duck, water repellent and mildew resistant	ea	1	1	1			
PC	4740-202-8653	HOSE ASSEMBLY W/ COUPLINGS: 4 in. id, 10 ft lg F-ZZ-H561 (81348)	ea	4	4	4			
PC	2990-972-7950	ROPE, STARTING: 9786E121 (97403)	ea	1	1	1			
		DEPARTMENT OF THE ARMY OPERATOR, ORGANIZATIONAL, DS AND GS MANUAL TM 5-2805-206-14	ea	1	1	1			
		DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5-2805- 206-14	ea	—	1	1			
		DEPARTMENT OF THE ARMY OPERATOR, ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE MANUAL TM 5-4320-222-15	ea	1	1	1			
		GROUP 76—FIRE- FIGHTING EQUIPMENT							
		7603—FIRE EXTIN- GUISHERS							
PC	4210-555-8837	EXTINGUISHER, FIRE: monobromotrifluo- romethane	ea	1	—	1			

By Order of the Secretary of the Army:

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

tribution:
To be distributed in accordance with DA Form 12-25, Section I, Organizational Maintenance requirements for Pumps, Centrifugal.

PUM
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TM 5-4

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TECHNICAL MANUAL

Operator, Organizational, Field and Depot Maintenance Manual

PUMP, RECIPROCATING: DIAPHRAGM; GASOLINE DRIVEN; WHEEL MOUNTED,
 RUBBER TIRES; 4 IN.; 100 GPM AT 10 FT SUCTION LIFT (RICE PUMP AND
 MACHINE CO. MODEL 40-327) FSN 4320-829-8434, LESS MIL STD ENGINE

TM 5-4320-222-15 }
 CHANGES No. 1 }

HEADQUARTERS,
 DEPARTMENT OF THE ARMY
 WASHINGTON 25, D. C., 2 May 1963

TM 5-4320-222-15, 3 April 1962, is changed as follows:

Page 2. Paragraph 1.

c. (Superseded) Report all deficiencies in this manual on DA Form 2028. Submit recommendation for changes, additions, or deletions to the Commanding Officer, U. S. Army Mobility Support Center, ATTN: SMOMS-MS, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

2. Record and Report Forms (Superseded)

a. DA Form 2258 (Depreservation Guide of Engineer Equipment).

b. For other record and report forms applicable to operator and organizational maintenance, refer to TM 38-750.

Note. Applicable forms, excluding Standard Form 46, which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Page 15, paragraph 8a, line 1. Delete before-operation and substitute: daily preventive maintenance.

Page 20, paragraph 17a, line 1. Delete before-operation and substitute: daily preventive maintenance.

Paragraph 18b. (Rescinded)

Page 29.

35. General (Superseded)

To insure that the deep well pump is ready for operation at all times, it must be inspected

systematically, so that the defects may be discovered and corrected before they result in serious damage or failure. The necessary Preventive Services to be performed are listed and described in paragraphs 36 and 38. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

36. Daily Preventive Maintenance Services (Superseded)

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. Daily services retain the same item numbers used in Quarterly Preventive Maintenance Services. Therefore, Daily Preventive Maintenance Services may not be numbered consecutively but should be performed in the numerical sequence as shown to insure complete coverage. Refer to Figure 17.1 for the Daily Preventive Maintenance Services.

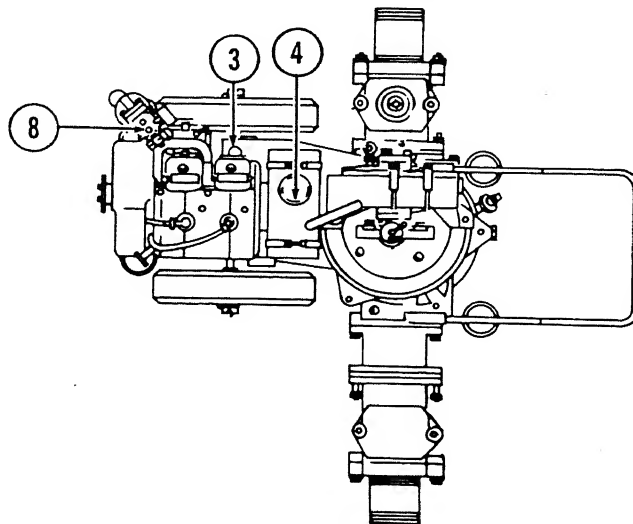
PREVENTIVE MAINTENANCE SERVICES

DAILY

TM5-4320-222-15

RICE PUMP AND MACHINE CO
MODEL 4D-327

PUMP



ITEM	LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER	PAR REF
3	<u>CRANKCASE FILL AND LEVEL GAGE.</u> Check oil level. Add oil as required. Reference L05 2805-206-14.	
4	<u>FUEL TANK.</u> Inspect for leaks.	
8	<u>CONTROLS AND INSTRUMENTS.</u> Inspect for improper operation. Reference TM5 2805-206-14	
	<u>NOTE 1. OPERATION.</u> During operation observe for any unusual noise or vibration.	
	<u>NOTE 3. FIRE EXTINGUISHER.</u> Inspect for broken seal.	

MSC 4320-222-15/17.1

Figure 17.1. (Added) Daily preventive maintenance services.

Page 29. Paragraph 37. (Rescinded)

Page 30.

**38. Quarterly Preventive Maintenance
Services
(Superseded)**

a. This paragraph contains an illustrated
tabulated listing of preventive maintenance

services which must be performed by Organiza-
tional Maintenance personnel at quarterly in-
tervals. A quarterly interval is equal to 3 cal-
endar months, or 250 hours of operation,
whichever occurs first.

b. The item numbers are listed consecutively
and indicate the sequence of minimum require-
ments. Refer to Figure 17.2 for the Quarterly
Preventive Maintenance Services.

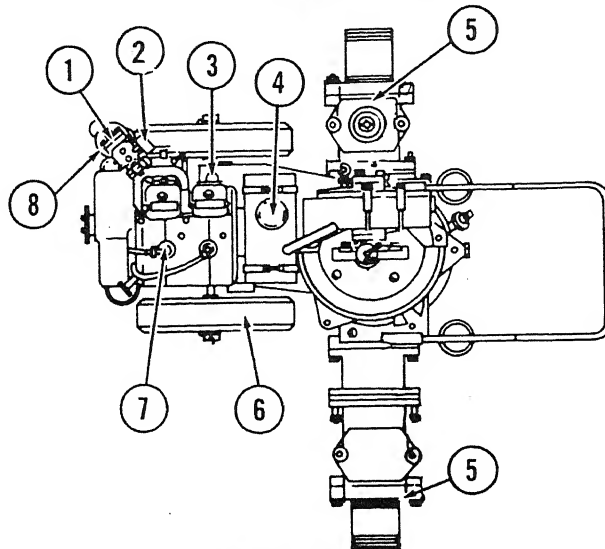
PREVENTIVE MAINTENANCE SERVICES

QUARTERLY

TM5-4320-222-15

RICE PUMP AND MACHINE CO.
MODEL 4D-327

PUMP



ITEM

LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

PAR REF

- | | | |
|---|--|--|
| 1 | <u>CARBURETOR.</u> Inspect for leaks and improper operation. Reference TM5 2805-206-14. | |
| 2 | <u>CONTACT POINTS.</u> Inspect for damage and improper gap. Correct gap is 0.018 inch. Reference TM5 2805-206-14. | |
| 3 | <u>CRANKCASE FILL AND LEVEL GAGE.</u> Check oil level. Add oil as required. Reference L.O. 5 2805-206-14. | |
| 4 | <u>FUEL TANK, CAP, STRAINER, AND FUEL FILTER.</u> Inspect for leaks and damage. Clean a dirty strainer. Clean fuel filter bowl and screen. | |
| 5 | <u>SUCTION AND DISCHARGE VALVES.</u> Inspect for leaks and improper operation. | |
| 6 | <u>WHEELS.</u> Inspect for loose mounting. | |
| 7 | <u>SPARK PLUGS AND WIRING.</u> Inspect for carbon deposits. Correct gap is 0.024 - 0.026 inch. Correct torque is 25 to 27 foot-pounds. Inspect wiring for worn or frayed condition. Reference TM5 2805-206-14. | |

Figure 17.2. (Added) Quarterly preventive maintenance services.

ITEM		PAR REF
8	<u>CONTROLS AND INSTRUMENTS.</u> Inspect for damage and improper operation. Reference TM5 2805-206-14.	
	<u>NOTE 1. OPERATIONAL TEST.</u> During operation observe for any unusual noise or vibration.	
	<u>NOTE 2. ADJUSTMENTS.</u> Make all necessary adjustments during operational test.	
	<u>NOTE 3. FIRE EXTINGUISHER.</u> Inspect for broken seal. The monobromotrifluoromethane type must be weighed every 3 months and the cylinder replaced if the gross weight has decreased 4 ounces or more.	

MSC 4320-222-15/17.2

Figure 17.2—Continued.

Page 47. Paragraph 69.

b. (Superseded) *Worksheet and Preventive Maintenance*. Applicable forms listed in TM 38-750 shall be prepared for each major item of equipment when initially placed in limited storage, in accordance with the scheduled interval contained in AR 743-505. Perform required maintenance promptly to make sure equipment is mechanically sound and ready for immediate use.

c. (Superseded) *Operation*. Operate equipment in limited storage long enough to bring it up to operating temperature and insure complete lubrication of all bearings, gears, and the like, in accordance with the scheduled interval contained in AR 743-505. Equipment must be serviced and in satisfactory operating condition before it is operated.

Page 48, paragraph 71, line 2. Delete third, fourth, and fifth echelons of and substitute: field and depot

Page 48, paragraph 71, line 3. Delete TM 5-505 and substitute: TM 38-750.

Page 56, paragraph 6. Delete AR 700-38 Unsatisfactory Equipment Report
After TM 5-505, add the following:
TM 38-750 The Army Equipment Record System and Procedures.

Page 62.

3. Comments and Suggestions (Superseded)

Suggestions and recommendations for changes to the Basic Issue Items List will be submitted on DA Form 2028 to the Commanding Officer, U. S. Army Mobility Support Center, ATTN: SMOMS-MS, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

By Order of the Secretary of the Army:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army.
The Adjutant General.

Distribution:

Active Army:

USASA (2)
DCSLOG (1)
CNGB (1)
TSG (1)
CofEngrs (3)
CSigO (1)
CofT (1)
USA Maint Bd (1)
USAARTYBD (2)
USAARMBD (2)
USAIB (2)
USARADB (2)
USA Abn Elct & SPWAR Bd (2)
USAAVNBD (2)
USCONARC (3)
USAMC (5)
OS Maj Comd (5) except USARJ (10)
MDW (1)
Armies (2)
Corps (2)
USA Corps (1)
Div (2)
Engr Bde (1)
USMA (2)
Svc Colleges (2)
Br Svc Sch (2) except
 USAES (100)
GENDEP (OS) (10)
Engr Dep (OS) (10)

Army Dep (2)
USA Trans Tml Comd (2)
Army Tml (1)
USAOSA (2)
Engr Dist (2)
Div Engr (2)
USAMOCOM (2)
Engr Fld Maint Shops (2)
USAERDL (3)
Engr Cen (5)
AMS (3)
Chicago Engr Proc Ofc (10)
USA Mbl Spt Cen (36)
ESCO (10)
Fld Comd, DASA (8)
USACOMZEUR (2)
USAREUR Engr Sup Con Agcy (10)
USAREUR Engr Proc Cen (2)
MAAG (1)
JBUSMC (1)
Units org under fol TOE:
 5-48 (2)
 5-237 (5)
 5-262 (5)
 5-267 (1)
 5-278 (5)
 5-279 (2)
 5-500 (EA,EB) (2)

NG: State AG (3).

USAR: Units—same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used see AR 320-50.

TECHNICAL MANUAL }
 No. 5-4320-222-15 }

HEADQUARTERS,
 DEPARTMENT OF THE ARMY
 WASHINGTON 25, D.C., 3 April 1962

Operator, Organizational, Field and Depot Maintenance Manual

**PUMP, RECIPROCATING: DIAPHRAGM; GASOLINE DRIVEN; WHEEL MOUNTED,
 RUBBER TIRES; 4 IN.; 100 GPM AT 10 FT SUCTION LIFT (RICE PUMP AND
 MACHINE CO. MODEL 4D-327) FSN 4320-829-8434, LESS MIL STD ENGINE**

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CHAPTER I

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of the personnel to whom the Reciprocating Pump, Model 4D-327 is issued. Chapters 1 through 5 provide information on the operation, daily preventive maintenance services, and organizational maintenance of the equipment, accessories, components, and attachments. Chapter 6 provides information for field and depot maintenance (3d, 4th, and 5th echelon). This manual also provides descriptions of the main units and their functions in relationship to other components.

b. Appendix I contains a list of publications applicable to this manual. Appendix II contains the maintenance allocation chart. Appendix III contains the list of basic issue items authorized the operator of this equipment. The Organizational, Field, and Depot Maintenance Repair Parts and Special Tool Lists are listed in TM 5-4320-222-25P.

c. Report all deficiencies in this manual on DA Form 2028. Submit recommendations for changes, additions, or deletions to The Commanding Officer, U. S. Army Engineer Maintenance Center, Corps of Engineers, ATTN: EMCDM-S, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

d. Report unsatisfactory equipment performance and suggestions for equipment improvement as specified in AR 700-38.

2. Operator and Organizational Maintenance Report Forms

a. DA 2258 (Depreservation Guide and Engineer Equipment).

b. For other record and report forms applicable to the operator, crew, and organizational maintenance, refer to TM 5-505.

Note: Applicable forms, excluding standard form 46 which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

3. Description

a. *General.* The reciprocating diaphragm type pump (figs. 1 and 2) is a gasoline engine driven, two wheel mounted, portable unit.

b. *Engine.* For description and data on the engine, refer to TM 5-2805-206-14.

c. *Pump.* The Rice Diaphragm Pump, Model 4D-327, is portable and frame mounted. The diaphragm pump is used mainly in removing liquids from working areas. The liquids to be pumped often contain large amounts of trash, mud, and sand. The pump is a positive displacement type capable of handling large quantities of air along with the liquid being pumped, which makes the pump ideal for handling of seepage in trenches and excavations or wherever liquid is to be kept to a minimum.

4. Identification and Tabulated Data

a. *Identification.* The reciprocating pump has one identification plate, The Corps of Engineers

Plate (fig. 3), located on the fuel tank bracket under the fuel tank (1, fig. 4).

b. Tabulated Data.

(1) Pump.

Manufacturer	-----	Rice Pump & Machine Company
Model	-----	4D-327
Type	-----	Diaphragm
Number of stages	-----	1
Method of priming	---	Diaphragm
Maximum volume flow.	100 gpm (gallons per minute)	
Maximum suction lift dynamic.	25 ft (feet)	
Maximum static discharge head.	25 ft	

(2) *Engine.* For engine tabulated data, refer to Technical Manual, TM 5-2805-206-14.

(3) Capacities.

Engine fuel tank	-----	1 gal (gallon)
Pump gearcase	-----	1 pt (pint)
Cam eccentric	-----	¼ pt

(4) *Shipping dimensions.*

Length 48 in. (inch)
 Width 40 in.
 Height 34 in.
 Weight 376 lb (pounds)

(5) *Maintenance and operating supplies.*

Refer to table I for a complete list of maintenance and operating supplies required for initial operation.

Table 1. *Maintenance and Operating Supplies*

Item	Component application	Source of supply	Federal stock No.	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
1.	0307 TANK, FUEL	10	9130-160-1817	FUEL, GASOLINE: 5-gal can as follows: 91A.	1 gal	2 gal	(1) Average fuel consumption is 0.25 gph of continuous operation.
2.	1311 WHEEL ASSEMBLY.	10	9150-190-0904	GREASE, AUTOMOTIVE AND ARTILLERY: 1-lb can as follows: GAA.	-----	(2)	(2) See current LO for grade application and replenishment intervals.
3.	5505 LUBRICATORS	10	9150-231-6656	OIL, LUBRICATING: 1-qt can or bulk as follows: Grade 9250 or	1½ qt	(2)	
		10	9150-265-9433	OE-30	1½ qt	(2)	
		10	9150-231-9040	Grade 9110 or	1½ qt	(2)	
		10	9150-265-9425	OE-10	1½ qt	(2)	
		10	9150-242-7602	OES	1½ qt	(2)	
4.	5509 GEAR-CASE	10	9150-577-5844	OIL, LUBRICATING, GEAR: 5-gal drums as follows: GO 90	¾ qt	(2)	
		10	9150-257-5440	GOS	¾ qt	(2)	

(6) *Performance data.*

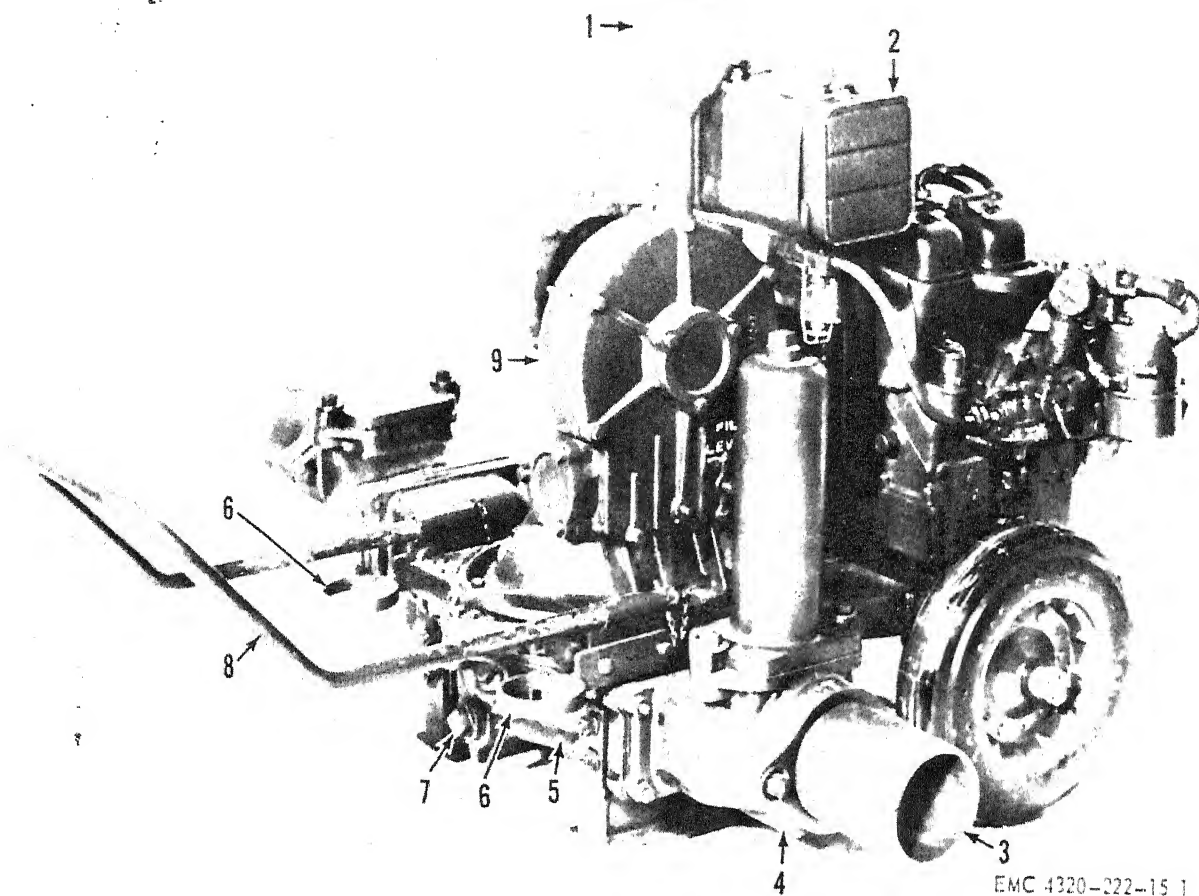
Table II. *Capacity in GPM with 4-Inch Suction and Discharge Hose*

Static suction lift	Static discharge head in feet					
	0	5	10	15	20	25
5 ft	100	100	100	95	85	80
10 ft	100	100	100	85	75	70
15 ft	75	75	69	60	53	40
20 ft	70	60	45	42	40	33

Pump operates at 60 strokes per minute, pumping clear water at 65°F. at sea level.

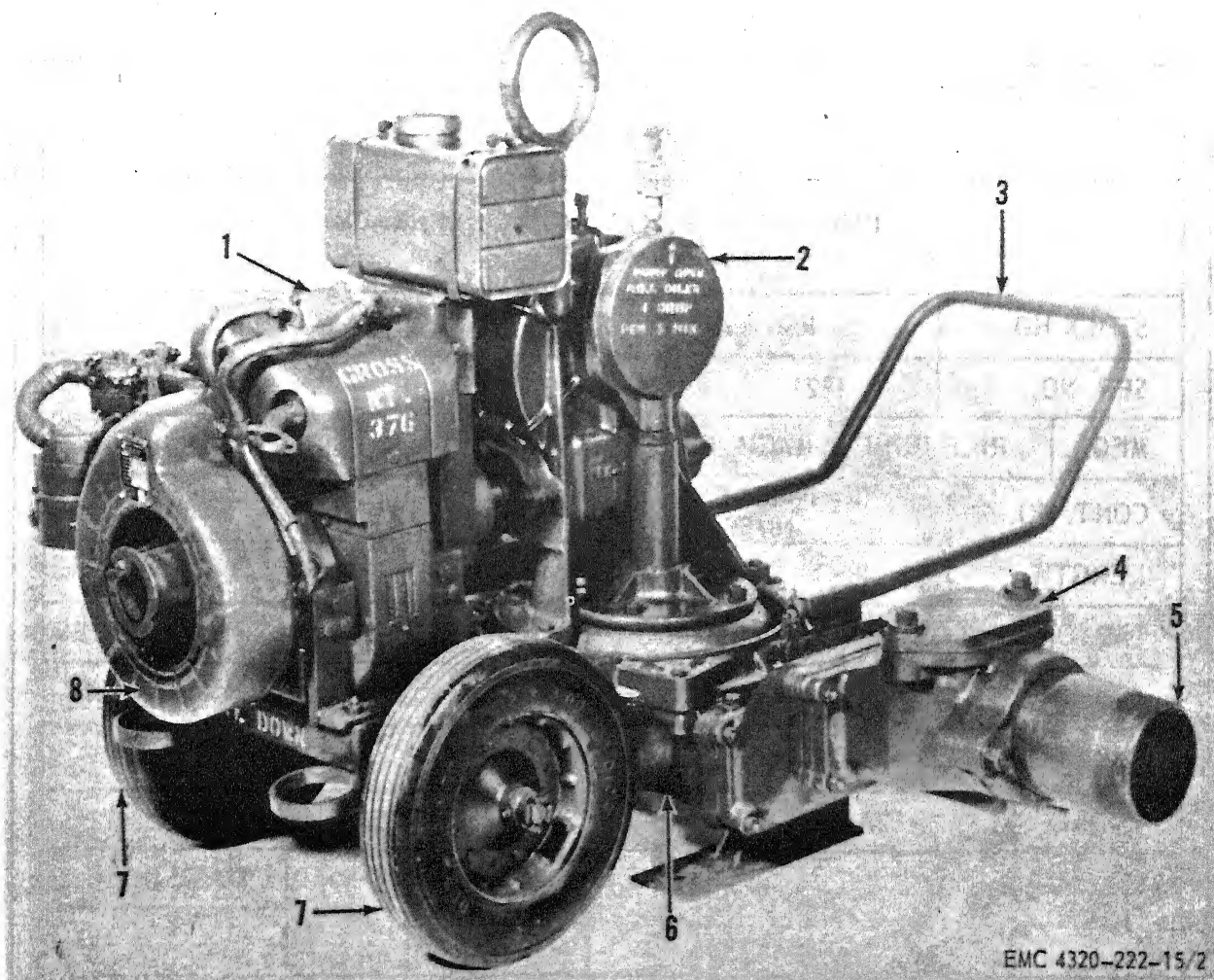
5. *Difference in Models*

This manual covers only the reciprocating diaphragm type pump Model 4D-327. No known unit differences exist for the model covered by this manual.



- | | | |
|------------------------|-------------------|--------------|
| 1 Lifting eyebolt | 4 Valve body | 7 Drain plug |
| 2 Fuel tank assembly | 5 Bowl | 8 Handle |
| 3 Nipple, pump suction | 6 Front hold down | 9 Gearcase |

Figure 1. Right front view of unit.



- 1 Engine
- 2 Cam eccentric
- 3 Handle

- 4 Clean out cover
- 5 Nipple, pump discharge

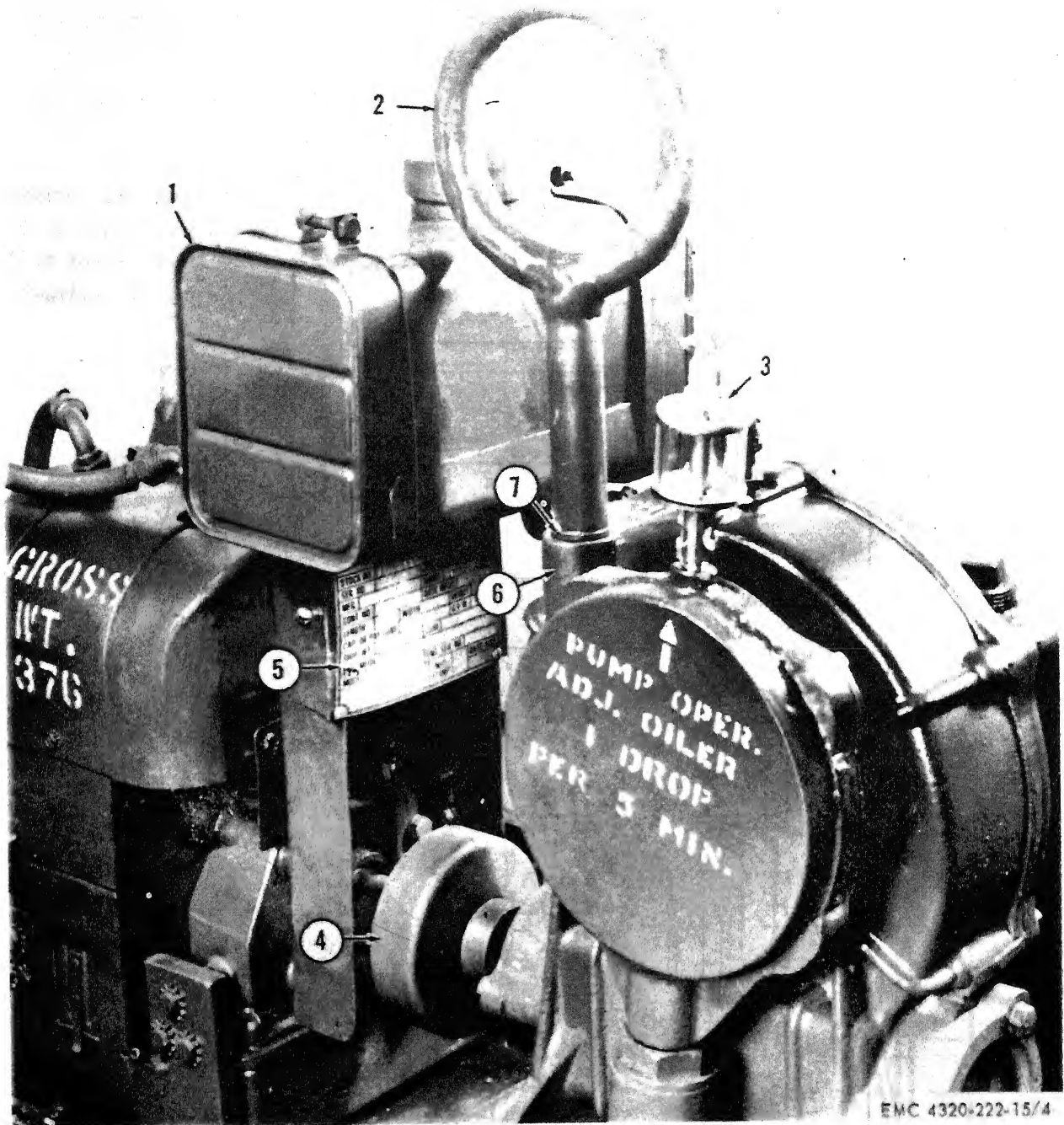
- 6 Pump bowl
- 7 Wheel (2 rqr)
- 8 Shroud

Figure 2. Pump left rear view.

CORPS OF ENGINEER U. S. ARMY A							
PUMP, RECIPROCATING DIAPHRAGM 100 G. P. M.							
STOCK NO.		FSN 4320-829-8434					
SER. NO.		1121		REG. NO.			
MFG.	RICE PUMP & MACH. CO.			MODEL	4D-327		
CONT. NO.		DA-11-184-ENG 18459		DATE MFGD		5-10-61	
LENGTH		48	WIDTH		40	HEIGHT	34
CAP. OR PAYLOAD						G. V. W.	LBS
SHIP. WT.				CUBE		FT.	
ENG. MFG.		CONTINENTAL MOTORS CORP.					
MODEL	2A016-2			ENG. SER. NO.		F00152	
				INSP. STAMP		DATE INSP	
						5-61	

EMC 4320-222-15/3

Figure 3. Identification plate.



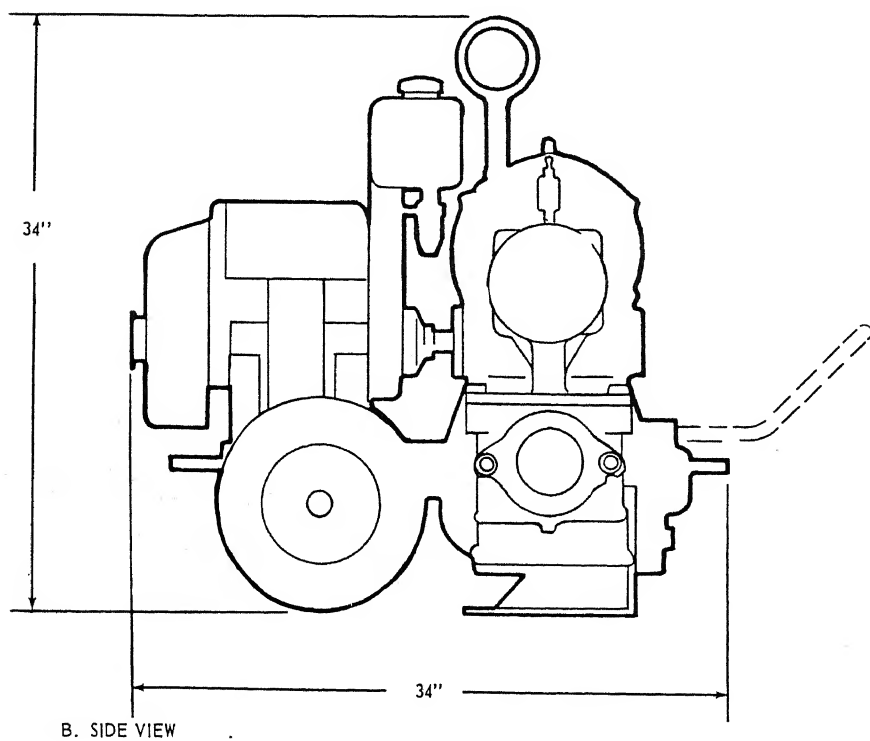
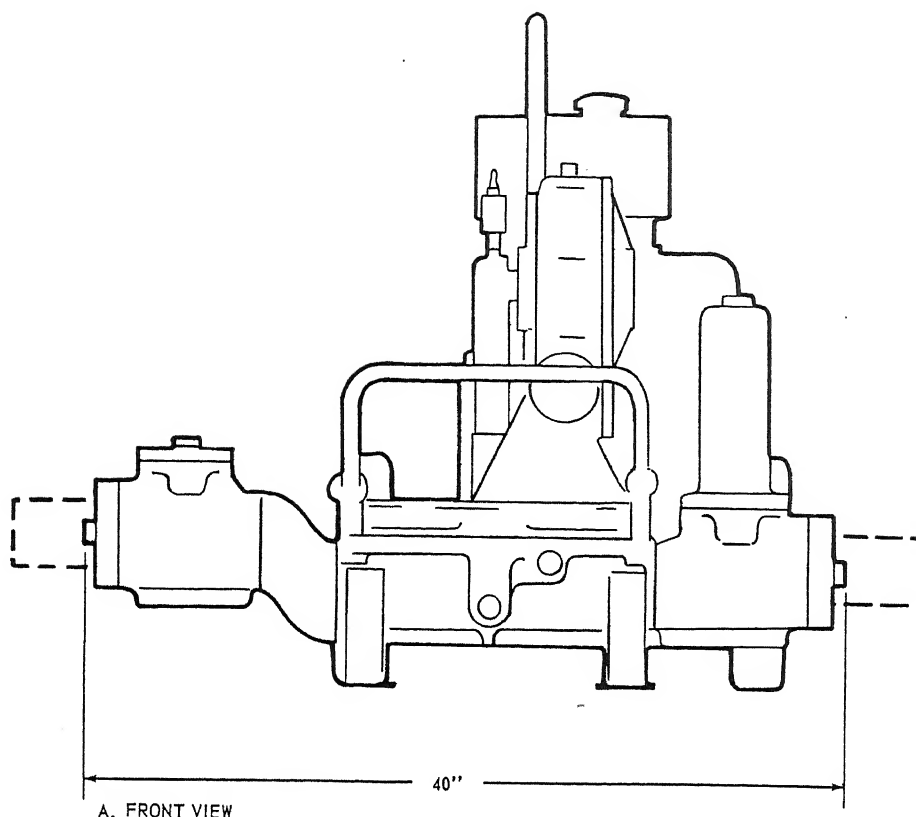
1 Fuel tank
2 Lifting eyebolt

3 Cam drive lubricator
4 Clutch coupling

5 Name plate
6 Gearcase

7 Washer

Figure 4. Name plate location.



EMC 4320-222-15/5

A—Front view of pump

B—Side view of pump

Figure 5. Dimensions—front and side view of pump.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

5. Unloading Equipment

a. The pump and hose crate may be removed with a forklift, or a suitable lifting device of sufficient capacity as shown in figures 6 and 7.

b. Avoid tipping the crated unit more than 25° in any direction while unloading.

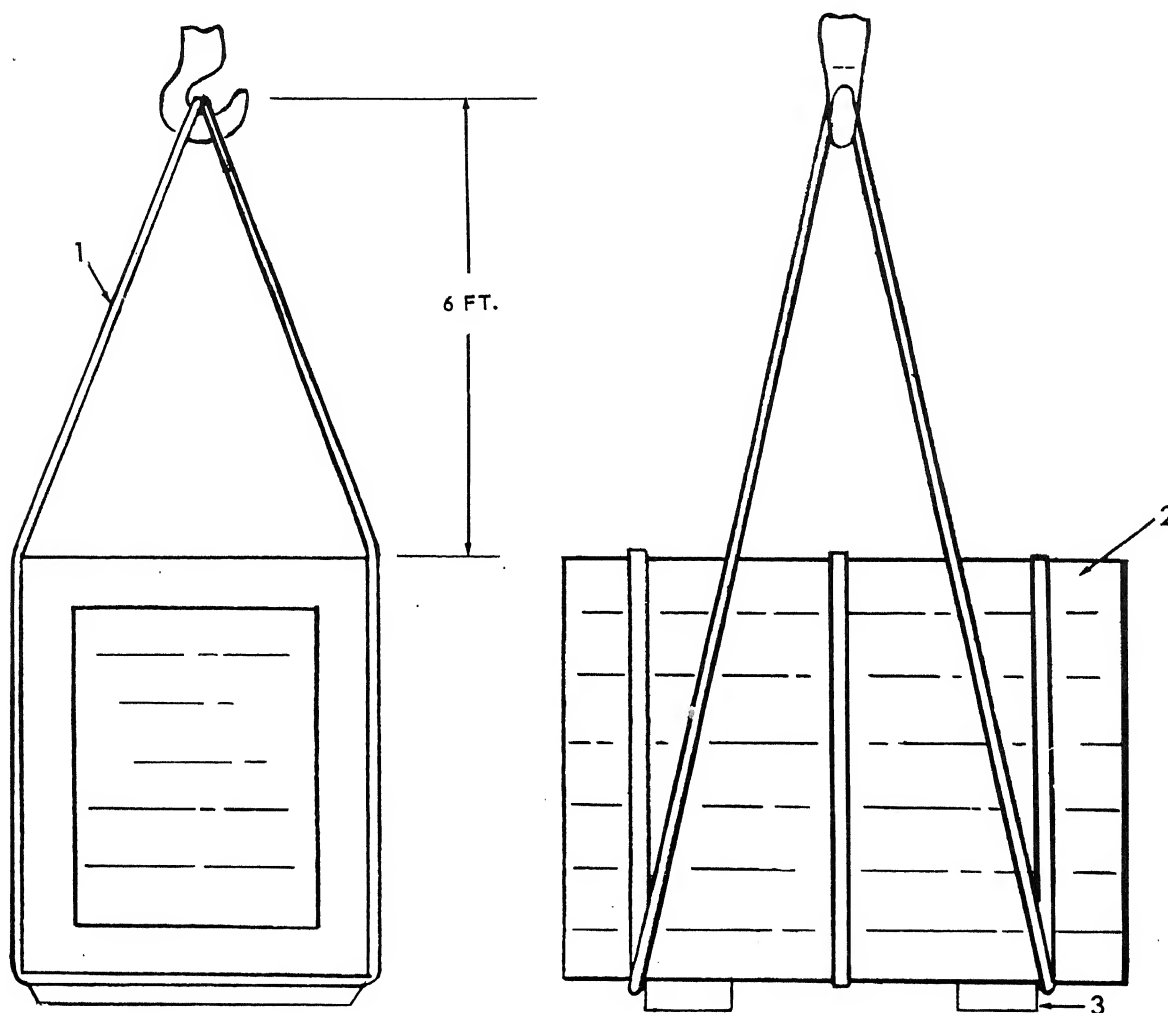
Caution: Do not drop or bump the unit.

7. Unpacking Equipment

a. *Unpacking.*

(1) Remove steel straps (2, fig. 6) from the top of the crate and remove top of crate (4, fig. 8).

(2) Remove steel straps (1), holding box (7), and remove the box (7) from the crate end (8).



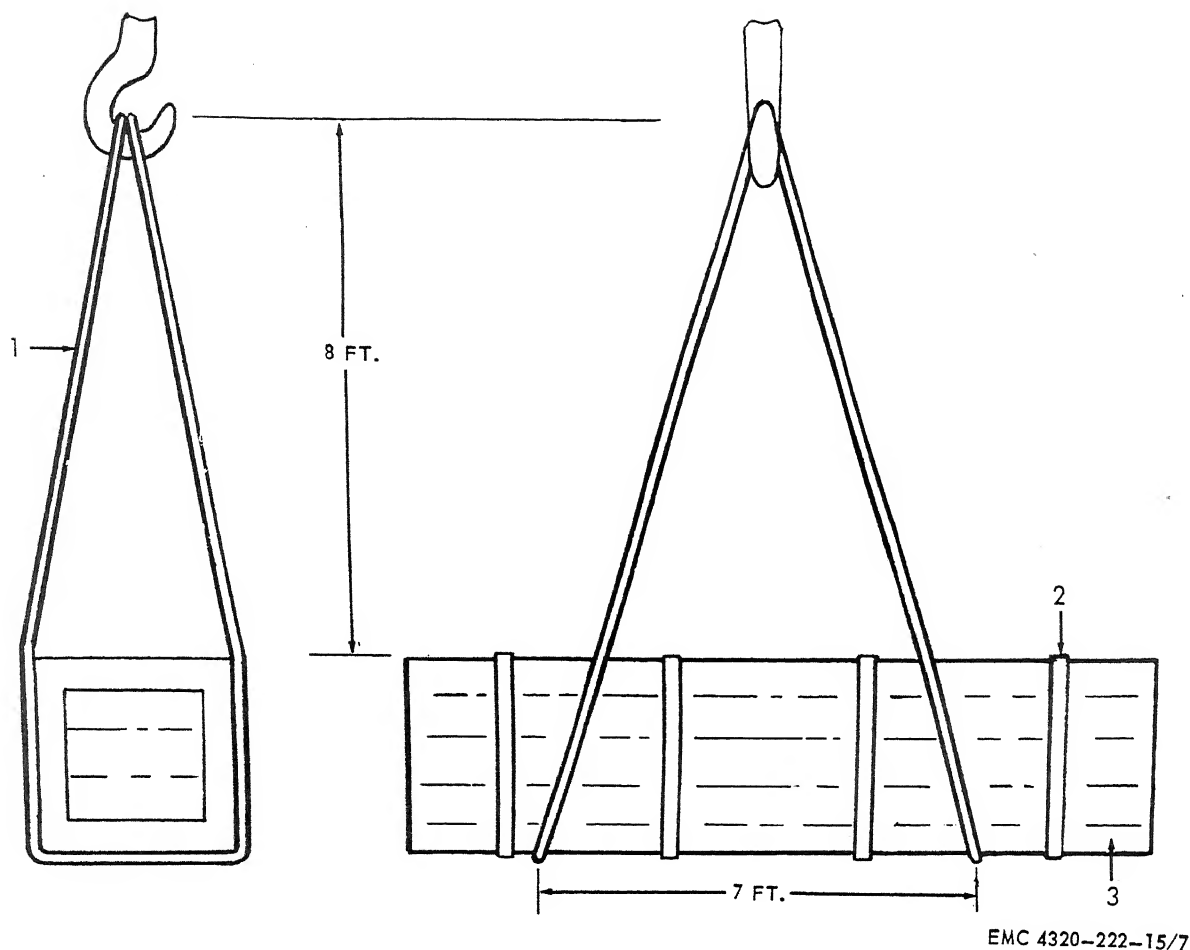
EMC 4320-222-15/6

1 Sling

2 Steel strap

3 Skid

Figure 6. Crated pump unit.



1 Sling

2 Steel strap

3 Hose crate

Figure 7. Hose crate and lifting slings.

- (3) Remove nuts (17 and 27) from bolts (18 and 24) and remove block (26) holding pump to crate bottom (21).
- (4) Lower the bolts (18 and 24) as far down as they will go.
- (5) Remove nut (23, fig. 8) from bolt (22) and remove discharge valve body (20) from crate bottom (21).
- (6) Remove nut (11, fig. 9) from bolt (8) and remove block (10) and nipple (9) from crate bottom (21, fig. 8).
- (7) Remove steel straps (1) and handle (12) from side of crate (11).
- (8) Remove steel straps (1) and lifting eyebolt (2) from end of crate (8).
- (9) For removal of pump from the crate by hand accomplish steps (1) through (8) and proceed as follows:
 - (a) Remove end of crate (8) and steel straps (1) from the handle (12). Remove the handle from the crate side (11) and install the handle (12) on the pump unit (par. 52).
 - (b) Inspect the pump for clearance and roll the unit from the crate bottom (21).
- (10) For removal of pump from the crate with power equipment accomplish steps (1) through (8) and proceed as follows:

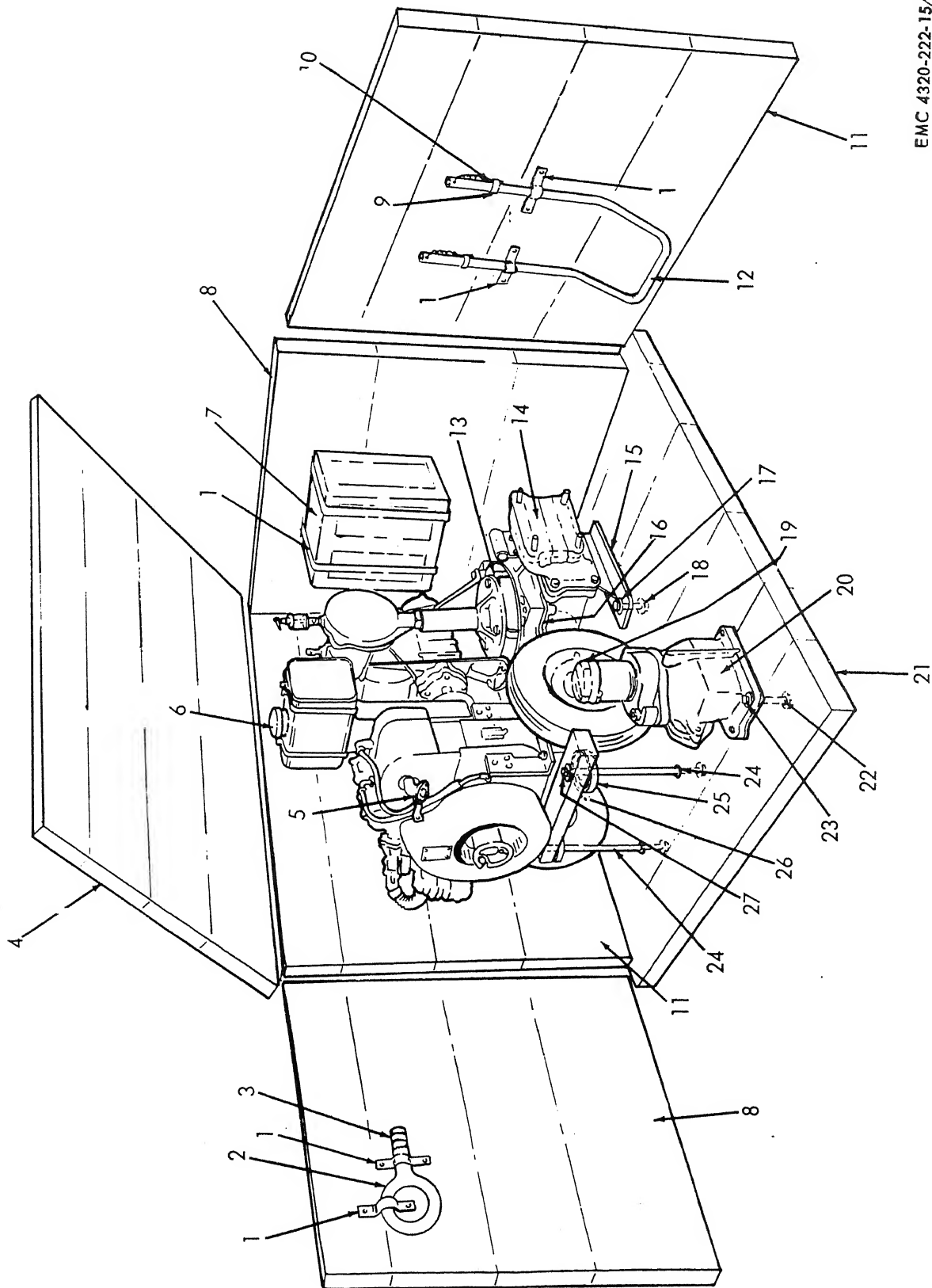
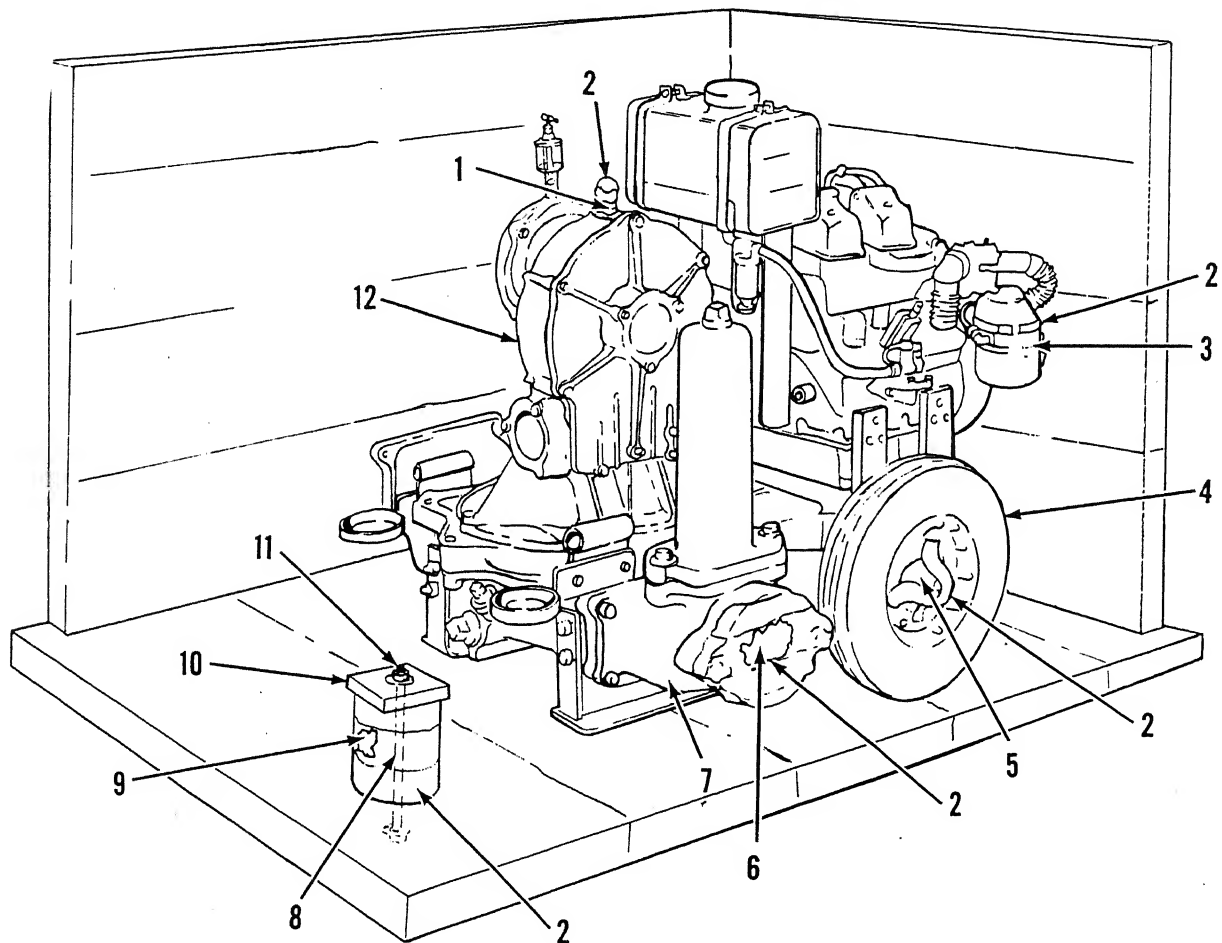


Figure 8. Left rear view of unit in crate.

EMC 4320-222-15/8

- | | | |
|-----------------------------------|---|-------------------------|
| 1 Steel strap | 10 Handle pin (2 rqr) | 19 Discharge valve body |
| 2 Lifting eyebolt | 11 Crate side | opening |
| 3 Tape (eyebolt threads) | 12 Handle | 20 Discharge valve body |
| 4 Crate top | 13 Fastening bracket | 21 Crate bottom |
| 5 Engine exhaust manifold opening | 14 Tape (opening on discharge side of pump) | 22 Bolt |
| 6 Fuel tank cap | 15 Stand | 23 Nut |
| 7 Box | 16 Wood brace | 24 Bolt |
| 8 Crate end | 17 Nut | 25 Tie down |
| 9 Tape (handle pin) | 18 Bolt | 26 Block |
| | | 27 Nut |

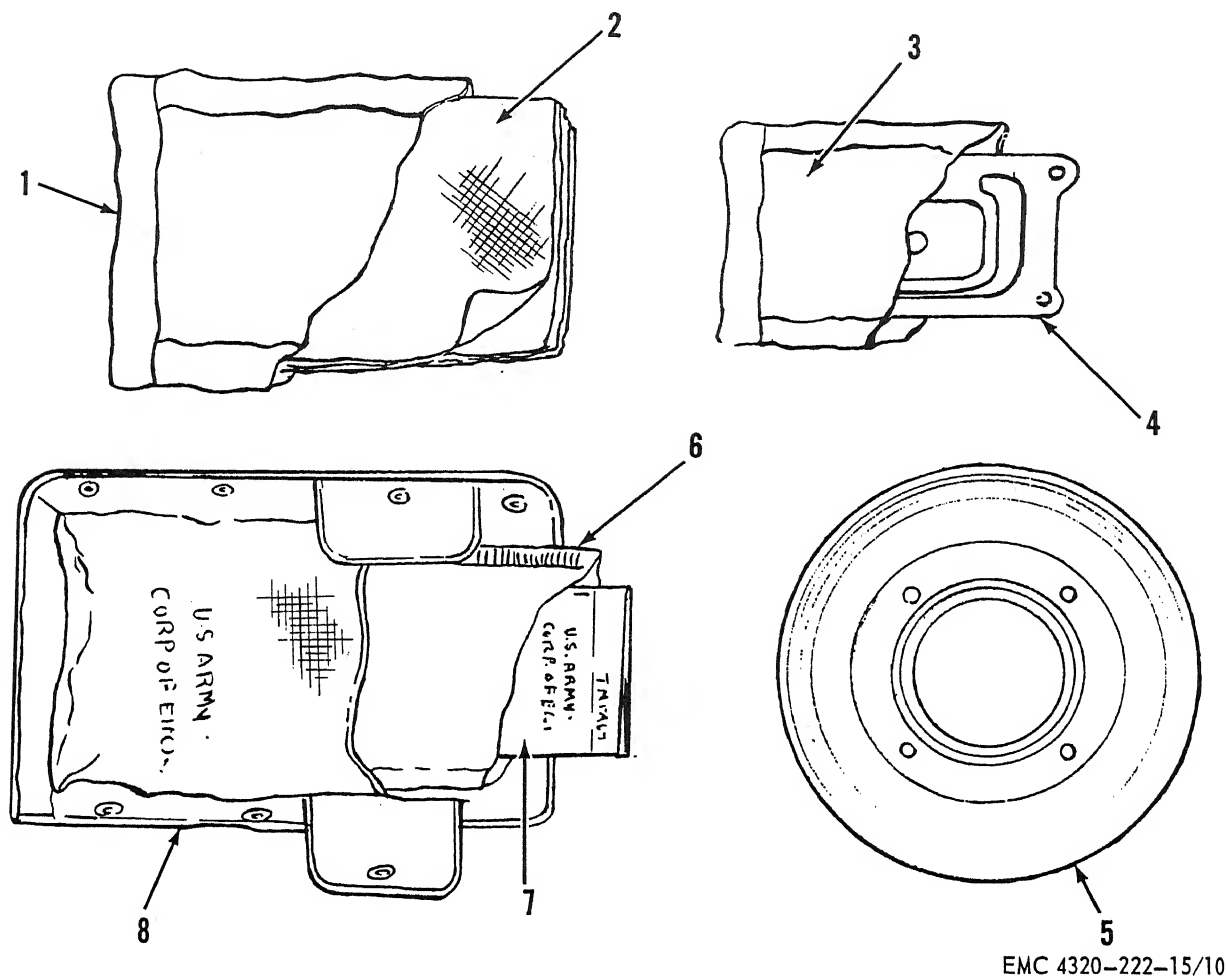
Figure 8—Continued.



EMC 4320-222-15/9

- | | | |
|----------------------|-------------------------|-------------|
| 1 Gearcase breather | 5 Hub | 9 Nipple |
| 2 Tape | 6 Suction valve opening | 10 Block |
| 3 Engine air cleaner | 7 Suction valve | 11 Nut |
| 4 Wheel | 8 Bolt | 12 Gearcase |

Figure 9. Right front view of unit in crate.



Wiping cloth package
Wiping cloths

3 Check valve package
4 Check valves

5 Diaphragm
6 Manual package

7 Manuals
8 Case

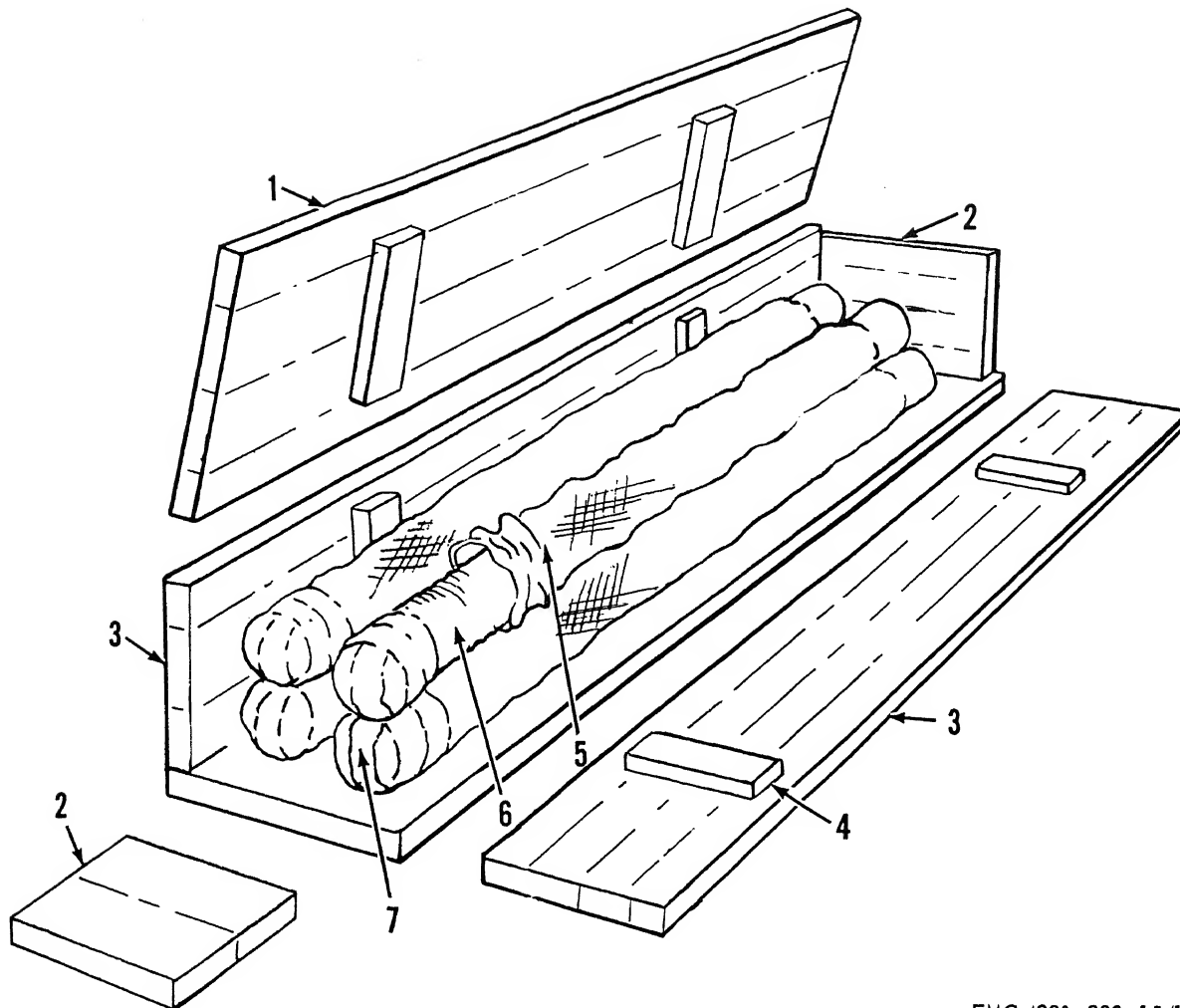
Figure 10. Separately packed parts.

- (a) Remove tape (3) from the lifting eyebolt threads and install the lifting eyebolt (2) in top of pump gear-case (12, fig. 9).
- (b) Attach power equipment to lifting eyebolt and lift the unit up and out of the crate.
- (11) Remove the cover from the box (7, fig. 8) and remove pump diaphragm (5, fig. 10), canvas case (8), packaged manuals (6), packaged check valve assemblies (3), and wiping cloths (1) from the box (7, fig. 8).
- (12) Remove steel straps (2) from around hose crate (3, fig. 7).
- (13) Remove top of hose crate (1, fig. 11) and remove hose (6) from the crate.

Caution: Exercise extreme care while uncrating to avoid damaging the equipment.

b. Removing Protective Material

- (1) Remove tape and barrier material from discharge side of pump (14, fig. 8), discharge valve body (20), openings (19), suction nipple (9, fig. 9), suction opening (6), gearcase breather (1), and the two hub caps (5).
- (2) Remove the tape (9, fig. 8) from handle (12) and lifting eyebolt (2).
- (3) Remove the tape (2, fig. 9) from the engine air cleaner (3), engine exhaust manifold opening (5, fig. 8), and the fuel tank cap (6).



EMC 4320-222-15/11

1 Crate top
2 Crate end

3 Crate side
4 Block

5 Burlap wraps
6 Hose

7 Tape

Figure 11. Hose and crate.

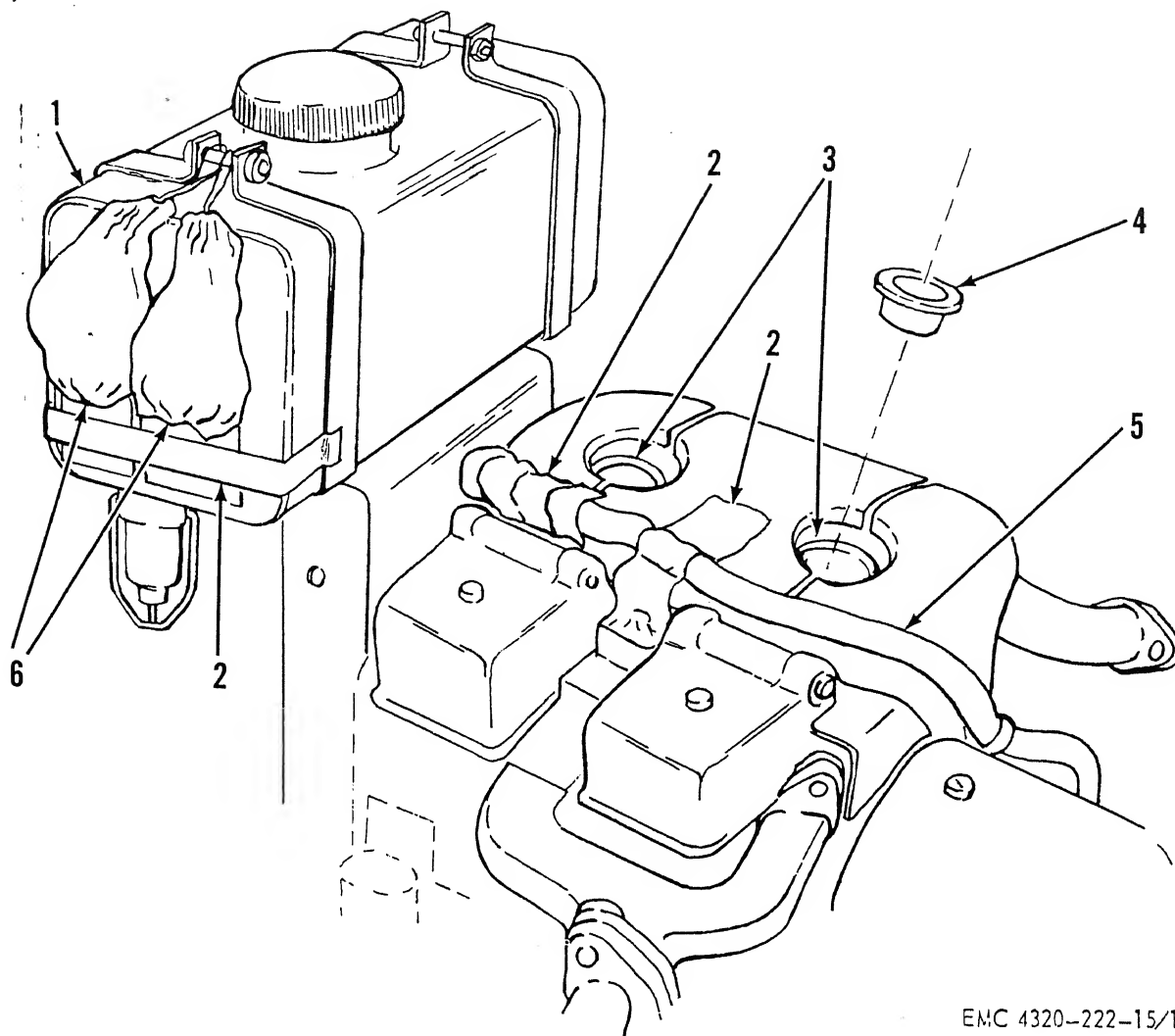
- (4) To remove the fastening brackets (13) and wood brace (16), remove the pump eccentric assembly (par. 81).
- (5) Remove burlap wraps (5, fig. 11) from hose (6) and remove tape (7) from the hose openings.
- (6) Remove wiping cloths (2, fig. 10) from wiping cloth package (1), check valves (4), from check valve package (3), manuals (7) from manual package (6) and diaphragm (5) from the box (7, fig. 8).
- (7) Remove bags (6, fig. 12) from fuel

tank (1) and remove spark plugs and fuel tank drain plug from the bags (6).

c. Removal of Protective Material for Units Preserved and Packaged for Controlled Humidity Storage.

Note. Under controlled humidity storage all openings should not be closed, therefore steps 1 and 3 above are not necessary.

- (1) Remove tape (2, fig. 12) from ignition leads (5).
- (2) Remove vented plugs (4) from spark plug openings (3).



EMC 4320-222-15/12

- | | | | |
|-------------|-----------------------|------------------|---------------------------------|
| 1 Fuel tank | 3 Spark plug openings | 5 Ignition leads | 6 Bags (containing spark plugs) |
| 2 Tape | 4 Vented plugs | | |

Figure 12. Protective material for controlled humidity pack.

8. Inspecting New and Used Equipment

a. Perform the before-operation services listed in paragraph 35.

b. Make a complete visual inspection to see that the required tools, publications, accessories, and attachments are with the pump.

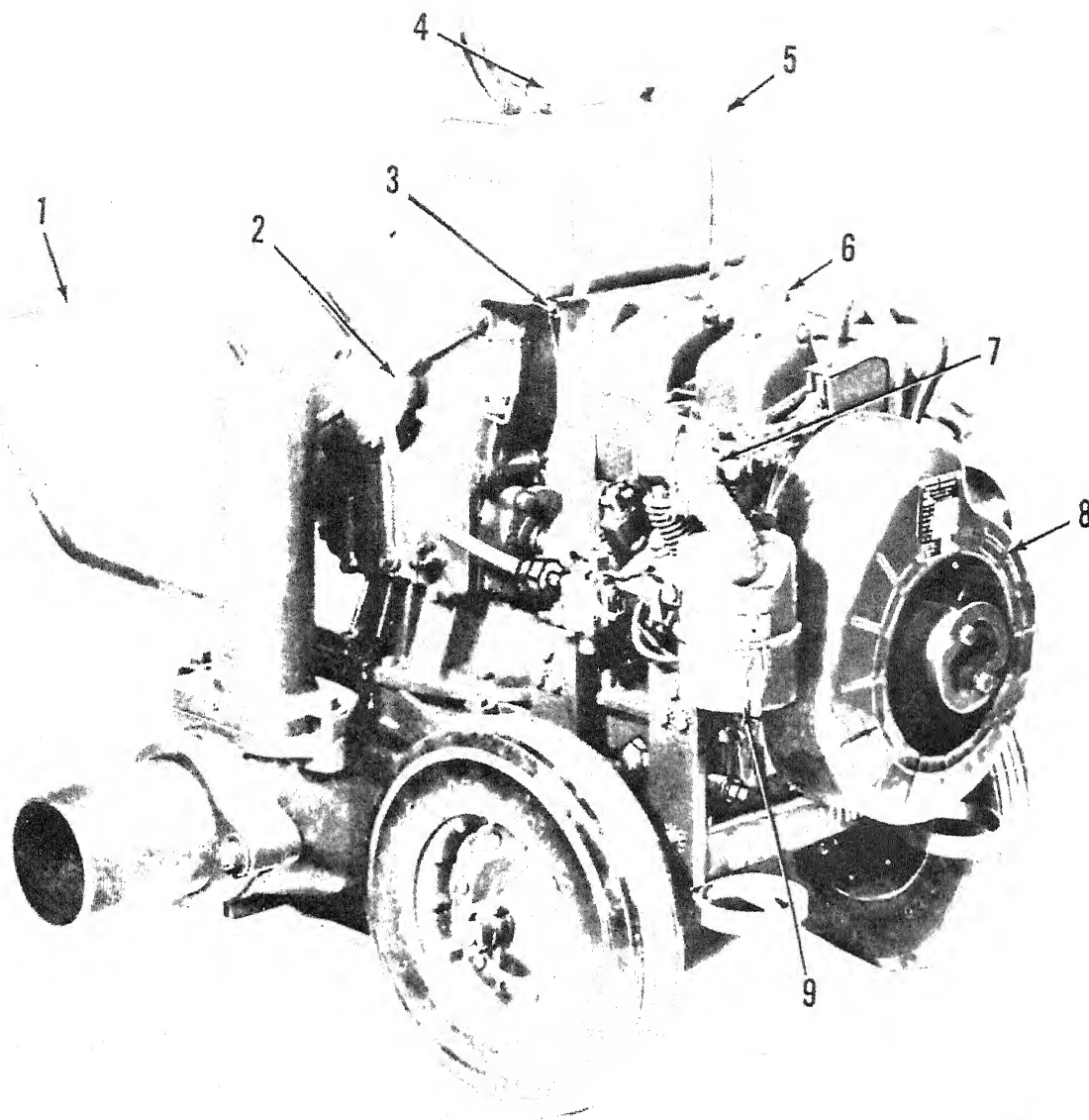
c. Inspect the unit for loss of parts or mounting hardware. Inspect for damage that may have occurred during loading, removal, shipment, or storage of this equipment such as: bent or broken handles (1, fig. 13), shroud (8), fuel lines (2), ignition leads (6), fuel tank (5),

carburetor (7), air cleaner (9), and fuel tank cap (4).

d. Rotate the pump to see that it turns freely before attempting to start the unit.

e. For inspection of new or used engines, refer to TM 5-2805-206-14 Engine Manual. Correct all deficiencies noted or report them to field maintenance.

f. Inspect used equipment (a through d above), using extra care to insure a thorough inspection. Correct all deficiencies noted or report them to field maintenance.



EMC 4320-222-15-12

- | | | |
|--------------|------------------|---------------|
| 1 Handle | 4 Fuel tank cap | 7 Carburetor |
| 2 Fuel line | 5 Fuel tank | 8 Shroud |
| 3 Drain plug | 6 Ignition leads | 9 Air cleaner |

Figure 13. Inspection areas.

9. Installation of Separately Packed Components

- a. Install diaphragm (5, fig. 10) (par. 80).
- b. Install check valves (4) and valve body (20, fig. 8) (par. 58).
- c. Install lifting eyebolt (2) (par. 56).
- d. Install handle (12) (par. 52).
- e. Install nipple (9, fig. 9) (par. 9).
- f. Install spark plugs, refer to TM 5-2805-206-14 Engine Manual.
- g. Install the fuel tank drain plug (3, fig. 13) in the bottom of fuel tank (5).

10. Installation or Setting-Up Instructions

a. Installation of Pump.

- (1) Place the pump unit on a location that is stable and level so that pump will not move or pull from site due to vibration.
- (2) At no time should the pump exceed a 15° tilt while in operation.
- (3) For good maximum capacity the pump should be placed as close as possible to the liquid level.
- (4) Select a site where there will be sufficient space on all sides of the unit for servicing while in operation.
- (5) If the pump is operated within an inclosed area, make sure that there is proper ventilation and that the exhaust gases are piped to the outside.

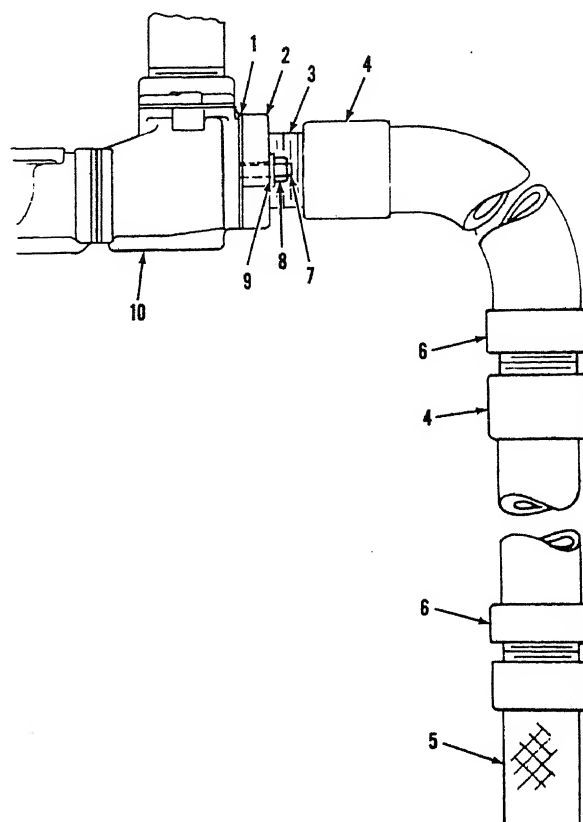
Warning: Never operate the pump in an inclosed area unless the exhaust gases are piped to the outside. Exhaust gases contain carbon monoxide, which is a colorless, odorless, and poisonous gas.

b. Hose Installation.

- (1) Use only wire reinforced noncollapsible hose for pump suction. The suction side of the pump should be air tight.
- (2) Support the suction hose so that the hose weight is not borne by the pump.
- (3) Lay the hose as straight as possible to prevent air traps.

Caution: Always place strainer on end of suction hose to prevent large objects from entering and damaging the connecting rod and cam eccentric.

- (4) Use a noncollapsible type hose on the discharge side of the pump.
- (5) Lay the hose on the discharge side of the pump as straight as possible to prevent air traps.
- (6) Install nipple (3, fig. 14) in female end of hose (4).
- (7) Install adapter (2) on other end of nipple.
- (8) Tighten nipple (3), hose (4), and adapter (2). Use pipe compound on suction side of pump.
- (9) Position gasket (1) between adapter (2) and valve body (10), position



EMC 4320-222-15/14

- | | |
|-------------------------|-----------------------|
| 1 Gasket | 5 Strainer |
| 2 Adapter | 6 Hose (male opening) |
| 3 Nipple | 7 Stud |
| 4 Hose (female opening) | 8 Nut |
| | 9 Washer |
| | 10 Valve body |

Figure 14. Hose installation.

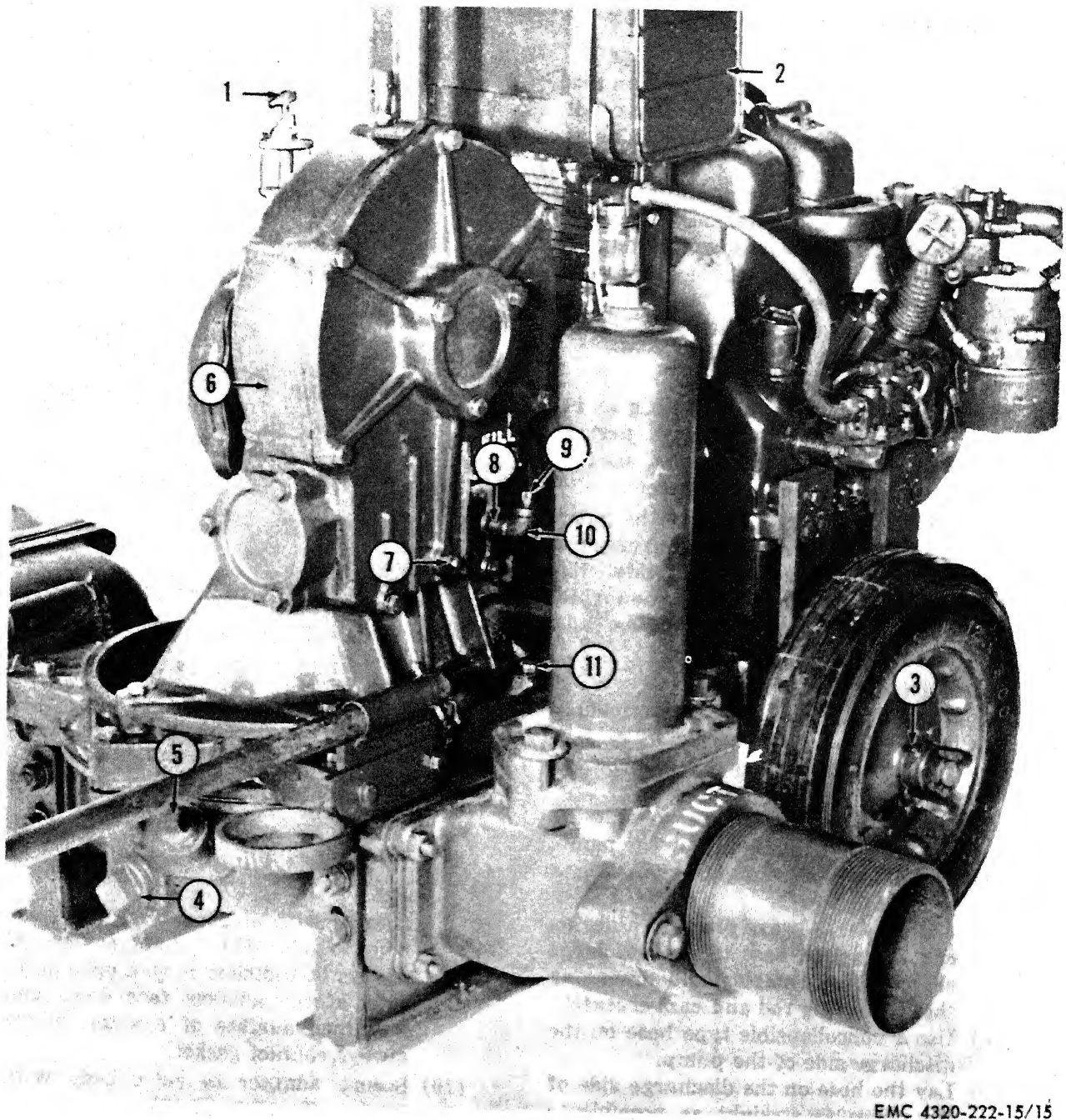
adapter with nipple and hose on valve body studs (7). Adapter should always be installed so that opening in slots of the adapter face down and machined surface of adapter should always contact gasket.

- (10) Secure adapter to valve body with washer (9) and nut (8).
- (11) Install additional sections of hose as required. Always place strainer (5) on end of suction hose.

11. Servicing New and Used Equipment

a. *General.* Perform an inspection of the equipment as outlined in (par. 36).

b. *Lubrication.* Lubricate the engine and pump in accordance with current lubrication



- | | | |
|----------------------------|--------------|-----------------------|
| 1 Cam drive lubricator | 4 Drain plug | 8 Nipple |
| 2 Fuel tank | 5 Fill plug | 9 Fill and level plug |
| 3 Wheel bearing lube point | 6 Gearcase | 10 Elbow |
| | 7 Drain plug | 11 Screw |

Figure 15. Pump service areas.

order LO 5-4320-222-15 and TM 5-2805-206-14 Engine Manual. Lubricate pump cam through lubricator (1, fig. 15) and pump drive by removing fill and level plug (9).

c. Fuel.

- (1) Service the fuel filter. Refer to TM 5-4320-206-14 engine manual.
- (2) Remove the fuel tank cap (4, fig. 13) and fill the one gallon capacity engine fuel tank (5) with the proper grade of gasoline. Refer to table I for proper fuel.

Warning: Do not fill the fuel tank while the engine is running. Gasoline spilled on a hot engine may explode and cause serious injury to personnel.

Warning: When handling fuel, always provide a metal-to-metal contact between the container and the tank. This will prevent a spark from being generated as fuel flows over the metallic surfaces.

d. Preventive Maintenance. Perform the preventive maintenance services (par. 38).

Section II. MOVEMENT TO A NEW WORK SITE

12. Dismantling for Movement

a. General. The pump is push cart mounted so that the unit can be easily moved manually for short distances. If the pump is to be transported by carrier, block or tie it to the bed of the carrier to prevent shifting while being transported.

b. Short Distances.

- (1) Remove suction and discharge hoses by loosening nut (8, fig. 14) and removing suction and discharge hoses from the flange adapters.
- (2) Disconnect the exhaust pipe extension if used.
- (3) Make sure that the handle (1, fig. 13) is secure and in an outward position. The pump can now be moved a short distance manually.

c. Long Distances.

- (1) Remove suction hose by loosening two nuts (8, fig. 14) and removing suction hose from flange adapter. Remove the discharge hose in a similar manner.

- (2) Disconnect the exhaust pipe extension if used.
- (3) Cover the openings of the inlet and outlet adapters with protective covering to prevent damage and foreign matter from entering the pump.
- (4) Remove drain plug (7, fig. 1) and drain pump case.
- (5) Install drain plug (7) when pump case is completely drained.
- (6) Drain the fuel tank into a suitable container.
- (7) The pump can be loaded on a carrier by using a suitable lifting device, with sufficient capacity, attached to the lifting eyebolt (2, fig. 4); or by four or more men when the carrier bed height is not more than 3 feet from ground level.

13. Reinstallation After Movement to a New Work Site

For reinstallation of the pump after movement to a new work site, refer to paragraph 10.

Section III. CONTROLS AND INSTRUMENTS

14. General

The only controls for the pump are located on the engine. The pump has no instruments.

15. Controls

The engine controls are described, located, and illustrated in TM 5-2805-206-14.

Section IV. OPERATION OF EQUIPMENT

16. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for operation of the Reciprocating Pump, Rice Model 4D-327.

b. The operator must know how to perform every operation of which the reciprocating pump is capable. This section gives instructions on starting and stopping the pump, basic motions of the pump, and on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

17. Starting

a. Perform the before-operations services (par. 38).

Caution: Do not operate the pump unless the body is full of water. Operating the pump without water may cause serious damage to the pump.

b. On high suction lifts of 15 feet or over the pump must be primed. Remove the fill plug (5, fig. 15) and fill the bowl with water. Install the fill plug and tighten.

c. Start engine with starter rope provided with unit. Refer to TM 5-2805-206-14 for detailed starting instructions.

18. Stopping

a. Stop engine by depressing stop button on engine. Refer to TM 5-2805-206-14 for detailed stopping instructions.

b. Perform the after-operation services (par. 38).

19. Operation Under Usual Conditions

a. *General.* The reciprocating diaphragm pump operates at 60 strokes per minute. It will deliver the capacity shown in table II when pump is operating at 60 strokes per minute, pumping clear water at 68° F. at an atmospheric pressure of 29.92 inches of mercury. Capacities vary with different pumping conditions such as, varying amounts of solids contained in liquids, different pump elevations, and higher or lower temperatures. Pump performance can be varied by reducing or increasing the engine rpm (revolutions per minute). Refer to TM 5-2805-206-14 for maximum life of engine pump. It is recommended that unit not be run less than 45 strokes per minute or more than 70 strokes per minute.

b. *Hose.* Inspect suction and discharge hose to see that they are tight and well placed.

Section V. OPERATION UNDER UNUSUAL CONDITIONS

20. Operating in Extreme Cold

a. Keep the unit free of snow and ice at all times. Cover the unit when not in use, and provide suitable shelter for the unit when operating, if possible.

b. Keep the fuel tank full to avoid moisture condensation. Service the fuel filter frequently (TM 5-2805-206-14).

c. To avoid freezing, drain the pump when the flow of water is halted. Drain the pump bowl by removing the drain plug (4, fig. 15).

d. Remove and drain the discharge and suction hoses (par. 12).

e. Lubricate the pump and engine with low temperature lubrications. Refer to the current lubrication order and LO 5-2805-206-14.

21. Operating in Extreme Heat

a. If possible, protect the unit from the direct ray of the sun. The rubber parts such as: the diaphragm, tires, hoses will dry out and their life will be shortened.

b. Maintain adequate space around the unit to provide proper ventilation. If possible, install a fan to provide air circulation when operating the unit inside an inclosure.

c. Keep the exterior of the unit clean to provide proper heat transfer to air.

d. Lubricate the pump and engine with high temperature lubrications. Refer to the current lubrication order and LO 5-2805-206-14.

Caution: Do not pump water over 180°F. Damage to diaphragm will result.

22. Operation in Dusty or Sandy Areas

a. Shield the unit from dust or sand. Take advantage of natural barriers which offer protection from blowing dust or sand, or erect a suitable shield if possible.

b. Strain all fuel before adding it to the fuel tank. Use precautions to prevent dust or sand entering the fuel tank while fuel is being poured. Frequently service the fuel filter TM 5-2805-206-14.

c. Lubricate the pump and engine in accordance with the current lubrication order and LO 5-2805-206-14.

23. Operation Under Rainy or Humid Conditions

a. Cover the unit with a waterproof cover when the unit is outside and not operating. If the unit is operating, take advantage of natural barriers which offer protection from storms, or erect a suitable shelter, if possible.

b. Keep spark plug leads and parts clean and free of moisture.

c. Keep the fuel tank full to prevent moisture condensation. Service the fuel filter frequently TM 5-2805-206-14.

d. Lubricate the pump and engine in accordance with the current lubrication order and LO 5-2805-206-14.

24. Operation in Salt Water Areas

a. Wash unit frequently with clean, fresh water. Do not contaminate fuel system.

b. Coat exposed metal surfaces with rust-proofing material. Remove rust immediately and apply paint and/or oil as applicable.

c. After pumping salty, sandy, or dirty water containing corrosive elements, remove clean-out cover (4, fig. 2) on discharge valve body (10, fig. 14) and remove drain plug (4, fig. 15). Flush valve and valve bodies with clean water. The bowl (5, fig. 1) can be flushed by pushing open valve on suction side of pump. Remove all solids from valves.

d. Lubricate the pump and engine in accordance with the current lubrication order and LO 5-2805-206-14.

25. Operation at High Altitude

a. At high altitudes engine and pump performance will be less. Engine power will decrease 3.5 percent for each 1,000 feet above sea level. The suction lift on the pump should be reduced according to the elevation above sea level, this allows the same amount of water to enter the pump as would enter at the equivalent sea level lift.

b. Table III gives the reduction of suction necessary to equal the performance indicated at sea level.

(Example: 8.8 ft suction lift at 2,000 feet altitude would equal 10 feet suction lift at sea level).

High water temperatures also affect height of suction lift. Chart No. 1 gives maximum height of suction lifts for different water temperatures at various altitudes.

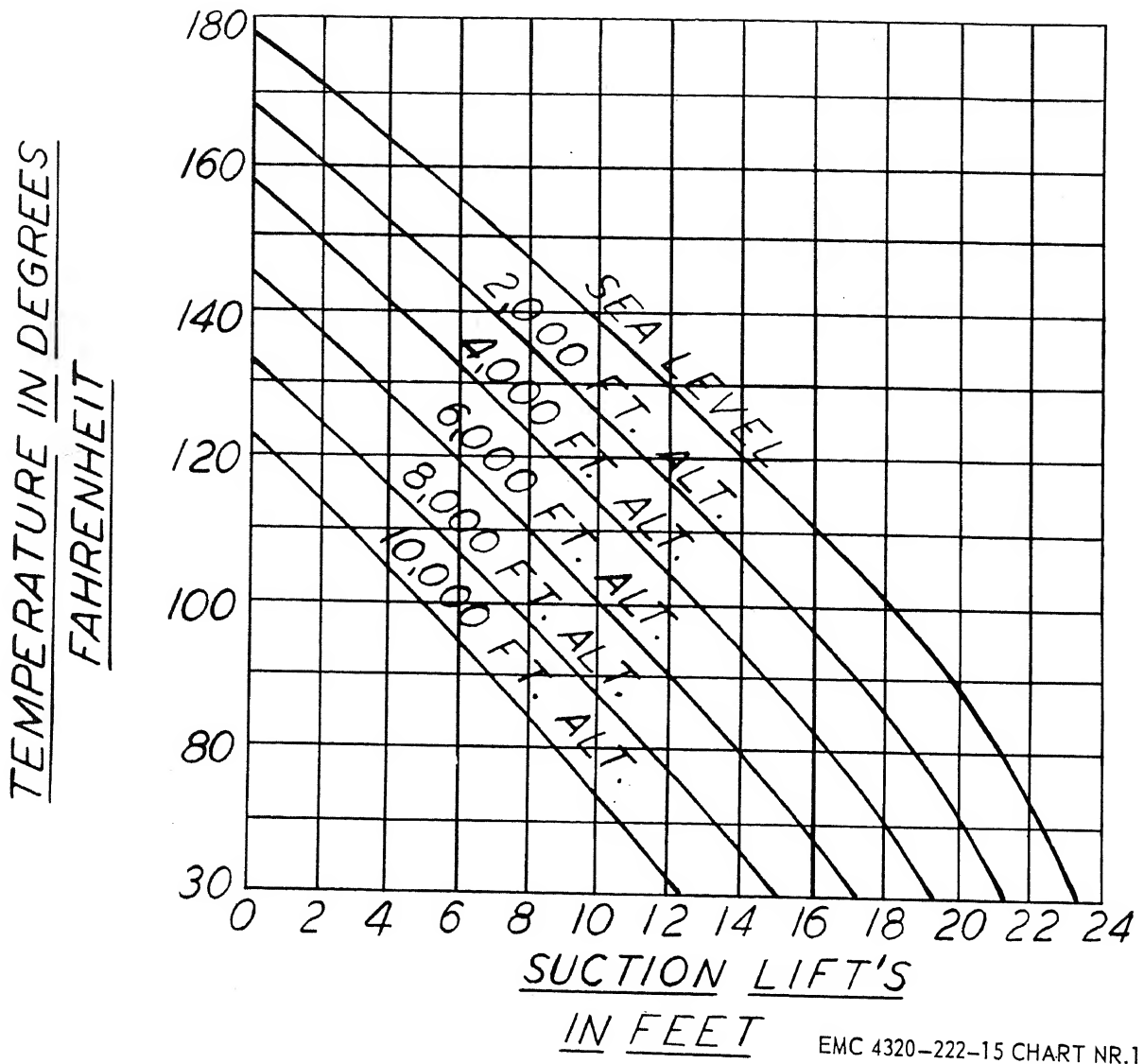
(Example: To find maximum suction lift when pumping water 100° F. at 4,000 feet altitude: find on left hand column the water temperature of 100° F. and follow line over to the right until it intersects diagonal line marked 4,000 feet altitude; at that point follow in a vertical line down to the number on the bottom line giving maximum suction lifts in feet. This should read 13.

Note. The figures shown in table III and chart No. 1 are based on using suction hose with one bend, length of hose not to exceed suction lifts by more than 6 feet.

Table III. Equivalent Suction Lifts at Different Altitudes

Suction lifts at sea level in feet	Altitudes in feet				
	2,000 ft.	4,000 ft.	6,000 ft.	8,000 ft.	10,000 ft.
10.....	8.8	7.8	6.9	6.2	5.7
15.....	13.2	11.7	10.4	9.3	8.6
20.....	17.6	15.6	13.8	12.4	11.4
25.....	22.	19.5	17.3	15.5	14.3

Chart 1. Practical Suction Conditions for Pumping Water of Different Temperatures and Altitudes



Section VI. OPERATION OF AUXILIARY MATERIAL USED IN CONJUNCTION WITH PUMP

26. Fire Extinguisher (Monobromotrifluoromethane Type)

The monobromotrifluoromethane type fire extinguisher replaces the carbon tetrachloride and carbon dioxide type fire extinguishers used in the past. It is generally suitable for use on all types of fires with exception of fires involved with LOX (liquid oxygen) generating equipment. The fire extinguisher is furnished with a disposable type cylinder.

27. Operation

To operate the fire extinguisher, perform the following operations:

- Remove fire extinguisher from its location.
- Break the seal by pulling the safety pin from the handle.
- Point the horn at the base of the flame.
- Depress trigger for discharge and direct the stream of contents at the base of the fire.

28. Replacement of Cylinder

To replace with new cylinder, perform the following operations:

- a.* Press lever to release pressure from old cylinder.
- b.* Loosen swivel valve coupling nut and remove the valve assembly from old cylinder.
- c.* Remove instruction band from used cylinder.
- d.* Place new cylinder through instruction band.

e. Replace safety pin in valve and seal pin with sealing wire.

f. Attach valve assembly and tighten swivel coupling nut on the new cylinder, and replace fire extinguisher in mounting bracket.

g. Adjust instruction band on cylinder to show maintenance and operating instructions.

29. Maintenance

Weigh fire extinguisher every 3 months and replace cylinder if gross weight has decreased 4 ounces or more. Lubricate cylinder neck threads with 1 drop of OE 30 oil before reassembly.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

30. Special Tools and Equipment

No special tools or equipment are required for the maintenance of the pump by the operator and organizational maintenance personnel.

31. Basic Issue Tools and Equipment

Tools and repair parts issued with or author-

ized for the reciprocating pump are listed in the Basic Issue Item List, appendix III of this manual.

32. Organizational Maintenance Repair Parts

Organizational maintenance repair parts are listed and illustrated in TM 5-4320-222-25P.

Section II. LUBRICATION

33. General Lubrication Information

a. This section contains a reproduction of the lubrication order and lubrication instructions which are supplemental to, and not specifically covered in the lubrication order.

b. The lubrication order shown in figure 16 is an exact reproduction of the approved lubrication order for the reciprocating pump. For current lubrication order, refer to DA Pam 310.4.

34. Detailed Lubrication Information

a. *Care of Lubricants.* Keep all lubricants (grease and oil) in closed containers and store in a clean dry place away from heat, allow no dirt, dust, water, or foreign material to mix with the lubricant at any time. Keep all lubrication equipment clean and ready for use.

b. *Points of Application.* Follow the detailed lubrication instructions given beneath each lubrication point illustration specified on the current lubrication order.

c. *Cleaning.* Keep all external parts not requiring lubrication clean from lubricants. After every lubrication operation, remove any excess lubricant from the point of application and wipe away any spilled lubricant. Old or

hardened lubricants may be removed by using an approved cleaning solvent.

d. *Operation after Lubrication.* Operate the unit for 5 minutes after lubrication to work the clean oil into bearing surfaces. Stop the unit and check the oil level. Add oil to bring the oil level up to FULL mark, if necessary.

e. Refer to TM 5-2805-206-14 for proper lubrication of the engine.

f. Check oil level of the pump drive assembly (9, fig. 15). Be sure that the pump is in level position. Add oil as required, in accordance with the current lubrication order.

g. Check the oil level sight glass (5, fig. 17). Fill through filler (4) when less than half full in accordance with the current lubrication order. Turn cam drive oiler ON with lever (1). Adjust oil drops seen through drop sight glass (6) with adjustment nut (2). Tighten for less oil, loosen for more oil. Lock adjustment nut by tightening locknut (3). Before starting new or repaired units, turn the lever (1) of the cam drive oiler ON so that 5 to 10 drops of oil go into cam housing (7). For the first half hour of operation set the drive cam oiler so it will feed 4 or 5 drops per minute. For regular operation set the drive cam oiler so it will feed one drop every 5 minutes.

LUBRICATION

ORDER

LO 5-4320-222-15

**PUMP, RECIPROCATING: DIAPHRAGM; GASOLINE DRIVEN;
WHEEL MOUNTED, RUBBER TIRES; 4 IN; 100 GPM AT 10
FT. SUCTION LIFT (RICE PUMP AND MACHINE CO
MODEL 4D-327) W/MILITARY STANDARD
ENGINE MODEL 2A016-2**

Reference: LC 5-2805-206-14, SM 10-1-C4-1

Intervals are based on normal operation. Reduce to compensate for abnormal operations and severe conditions. During inactive periods sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing.

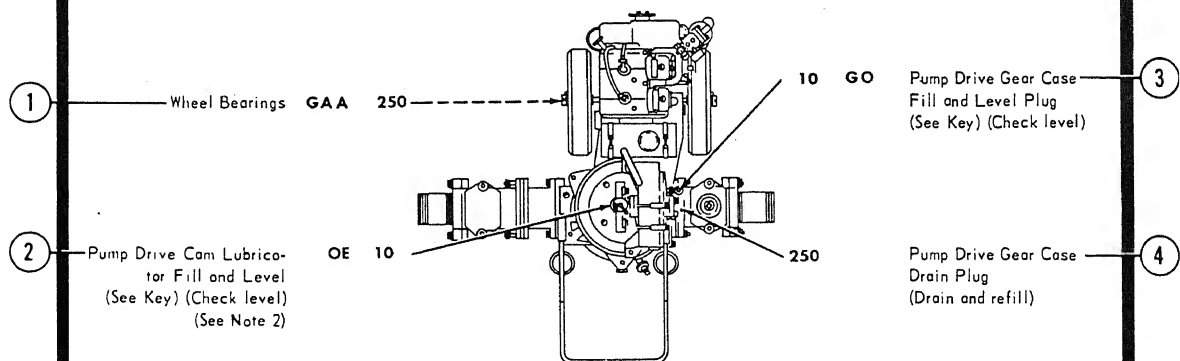
Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Drain gearcase only when hot after operations; replenish and check level when cool.

Lubricate points indicated by dotted arrow shafts on both sides of the equipment.

LUBRICANT • INTERVAL

INTERVAL • LUBRICANT



CONTINUED ON
FOLLOWING PAGE

EMC 4320-222-15/16 ①

Front

Figure 16. Lubrication order, LO 5-4320-222-15.

CONTINUED FROM
PRECEDING PAGE

— KEY —

		- KEY -			
LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above -32°F	-40°F to -10°F	0°F to -65°F	
OE—OIL, Engine, Heavy Duty		OE 30 or 9250	OE 10 or 9110	OES	Intervals given are in hours of normal operation.
Cam Lubricator	1 32 qt				
OES—OIL, Engine, Sub-zero					
GO—LUBRICATING OIL, Gear		GO 90	GO 90	GOS	
Pump Drive Gearcase	3 8 qt				
GOS—LUBRICATING OIL, Gear, Sub-zero					
GAA—GREASE, Automotive and Artillery		All Temperatures			

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. PUMP DRIVE CAM LUBRICATOR. Adjust lubricator valve to deliver one drop of oil every 2 minutes of operation. See TM 5-4320-222-15 for detailed instructions.

Copy of this Lubrication Order will remain with the equipment at all times, instructions contained herein are mandatory.

BY ORDER OF THE
SECRETARY OF THE ARMY:

G. H. DECKER,
General, United States Army,
Chief of Staff.

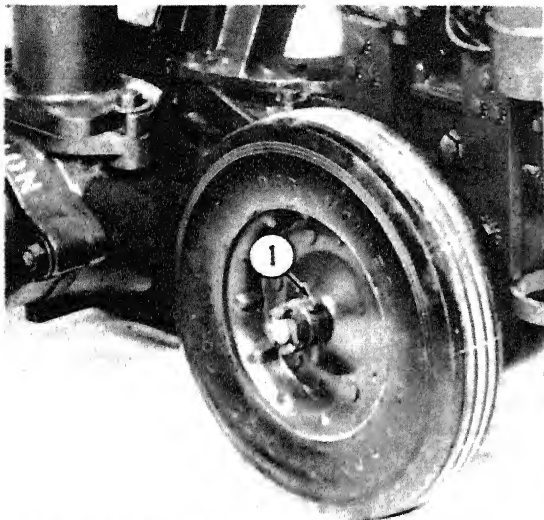
OFFICIAL:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

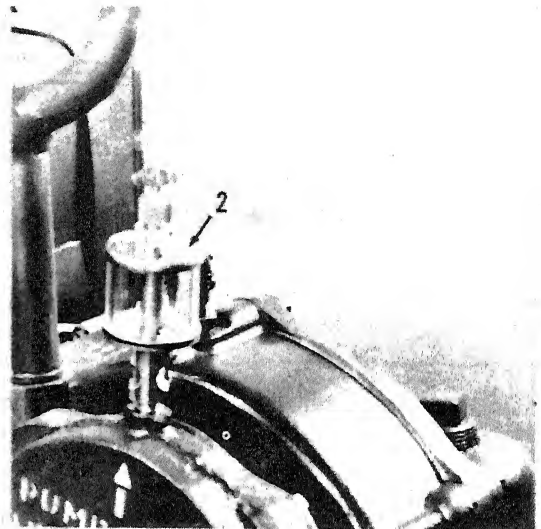
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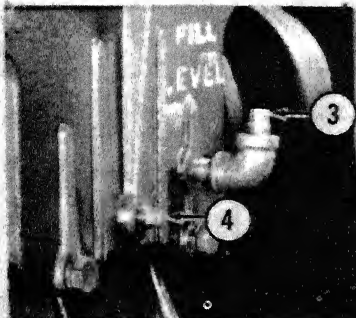
Figure 16. Lubrication order, LO 5-4320-222-15—Continued.



REF 1.WHEEL BEARINGS



REF 2.PUMP DRIVE CAM LUBRICATOR
FILL AND LEVEL

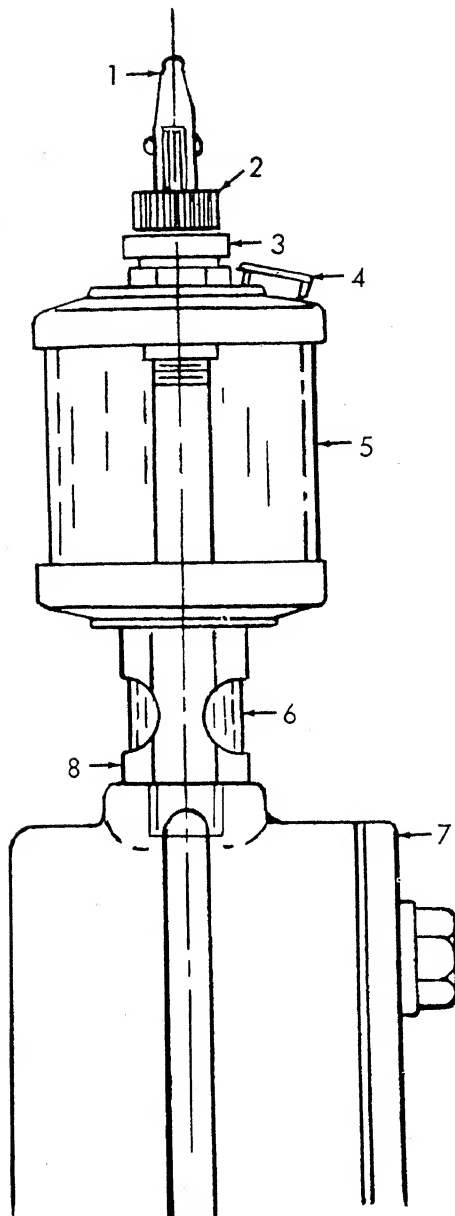


REF 3.PUMP DRIVE GEARCASE FILL AND LEVEL
PLUG

REF 4.PUMP DRIVE GEARCASE DRAIN PLUG

EMC 4320-222-15/16 ③

Figure 16. Lubrication order, LO 5-4320-222-15—Continued.



EMC 4320-222-15/17

- | | |
|-------------------------|-------------------------|
| 1 Lever (ON-OFF) | 5 Oil level sight glass |
| 2 Nut (drop adjustment) | 6 Drop sight glass |
| 3 Locknut | 7 Cam housing |
| 4 Filler | 8 Cam drive oiler |

Figure 17. Pump drive cam oiler.

Section III. OPERATOR'S DAILY SERVICES AND MAINTENANCE INSTRUCTIONS

35. General

To insure that the equipment is ready for operation at all times, it must be inspected systematically before operation, during operation, and after operation, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services shall be performed before operation. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which would damage the equipment if operation were

continued. After-operation services shall be performed by the operator after every operating period. After-operation services shall be performed at intervals based on the normal operation of the equipment. Reduce interval to compensate for abnormal conditions. Defects or unsatisfactory operating characteristics beyond the scope of the operator to correct must be reported at the earliest opportunity to organizational maintenance. Responsibility for performance of preventive maintenance services rests not only with the operator but also with the entire chain of command from section chief to commanding officer (AR 750-5).

36. Operator's Daily Services

Before operation	During operation	After operation	
X	X	X	<i>Visual inspection.</i> Inspect pump for water leaks or oil leaks. Inspect for bent, cracked or broken parts and for loose or missing parts. Correct all deficiencies or report them to organizational maintenance.
X		X	<i>Fuel.</i> Check the fuel supply and see that the fuel tank is full. Add fuel if necessary.
X		X	<i>Lubricants.</i> Measure the oil level in the pump drive unit. If necessary, add oil to level of oil level hole. Caution: Do not overfill. Fill oil reservoir to top. For the correct grade of lubrication, refer to the current lubrication order.
		X	<i>Cleaning.</i> See that the pump is clean and free of dirt and oil. Clean pump with approved cleaning solvent and dry thoroughly. Flush pump after pumping salty corrosive water. Drain pump and hose.
X			<i>Tampering.</i> Inspect to see whether the pump has been tampered with or damaged. Do not operate the pump until all deficiencies noticed have been corrected.
	X		<i>Unusual operation and noises.</i> Observe the pump for unusual operation such as engine overheating, excessive vibration, and failure of pump to function properly. If noises or irregularities are noticed, stop the pump and correct or report the condition to organizational maintenance. Do not resume operation until the deficiencies have been corrected.
		X	<i>Tools and equipment.</i> See that all tools and equipment assigned to the pump are in, on, or with the pump, and in clean serviceable condition.
X		X	<i>Publication.</i> See that a copy of this manual (TM 5-4320-222-15), DA Form 285, TM 5-2805-206-14, current lubrication order for the pump, and lubrication order LO 5-2805-206-14 are on or with the Rice Pump, Model 4D-327, in serviceable condition and properly stored.
			<i>Note.</i> Refer to TM 5-2805-206-14 for operator's daily service on the engine.

Section IV. ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

37. Organizational Maintenance

a. Preventive maintenance is performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equivalent

to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The preventive maintenance services to be performed at quarterly intervals are listed

consecutively and are described in paragraph 38. The service refers to a preventive maintenance service "Title" on DA Form 464 and indicates the services to be performed. The number listed under "Inspection" indicates the

minimum inspection requirement for the equipment.

c. Lubrication will be as prescribed in paragraph 34.

38. Quarterly Preventive Maintenance Services

Service		
Inspection	Quarterly	
GENERAL		
1	1	<i>Before-operation services.</i> Check and perform the services listed in daily before-operation services (par. 38).
2	2	<i>Lubrication.</i> Inspect for missing or damaged lubrication fittings, lines and grease cups and for indications of insufficient lubrication. Check for low lubricant level in the engine crankcase. Check for oil and grease leaks; also check for defective or damaged oil seals.
	2	Lubricate as specified in current lubrication order and LO 5-2805-206-14, engine lubrication order. Replace missing or damaged fittings. Correct or report all oil or grease leaks that are beyond the scope of organizational maintenance to field maintenance.
3	3	<i>Tools and equipment.</i> Inspect all tools and equipment assigned to reciprocating pump for damage.
	3	See that all tools and equipment assigned to reciprocating pump are clean, serviceable and properly stowed or mounted.
4	4	<i>Publications.</i> See that a copy of this operator's manual TM 5-4320-222-15, TM 5-2805-206-14, the current lubrication order for the pump, LO 5-2805-206-14 engine lubrication order and DA Form 285 are on or with reciprocating pump and serviceable condition.
5	5	<i>Appearance.</i> Inspect general appearance of reciprocating pump (figs. 1 and 2). Check for dirt, damage to identification markings, and poor condition of paint. See that deficiencies are corrected or reported to field maintenance.
6	6	<i>Modification.</i> Check to see that all available modification work order applying to reciprocating pump have been completed and recorded on DA Form 478, DA Form 5-73, and DA Form 5-73a. For additional quarterly preventive maintenance services for military standard engine, refer to TM 5-2805-206-14.
7	7	<i>Suction and discharge valves.</i> Inspect suction and discharge valves for improper operation.
	7	Replace defective suction or discharge valve (pars. 57-58).
8	8	<i>Pump Bowl.</i> Inspect pump bowl for leaks, cracks, or other damage. Report a defective pump bowl to field maintenance.
<i>Note.</i> Refer to TM 5-2805-206-14 for quarterly preventive maintenance services for the engine.		

Section V. TROUBLESHOOTING

39. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the reciprocating pump and its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance shall be reported to field maintenance, 3d echelon.

40. Pump Fails to Prime

Probable cause	Possible remedy
Leaks in suction connections.	Tighten all hose connections on suction side of pump. Use pipe compound on threads.

Probable cause	Possible remedy
Suction hose leaks -----	Check for leaks in suction hose.
Valves are stuck -----	Free valves by taking off valve cleanout cover and accumulator (par. 57, 58). Reach through opening in valve chambers. Take out debris and flush valve and seat with water. Place strainer on end of suction hose.
Valves are worn -----	Remove suction and discharge valve (pars. 57, 58). Replace worn parts.
Suction lift too high ----	Do not have suction lift more than 25 feet at sea level or a maximum height for equivalent elevations. See chart 1.

<i>Probable cause</i>	<i>Possible remedy</i>
Water has not been added to bowl.	For suction lifts of 15 feet or higher, remove fill plug (5, fig. 15) and fill bowl with water. Install fill plug.
Pump tilted -----	Place pump within 15 degrees angle.
Suction strainer clogged	Remove debris from suction strainer. Free strainer from mud.
Suction hose not properly submerged.	Have suction hose at least 4 to 5 feet below surface of water.

41. Pump Fails to Deliver Capacity

<i>Probable cause</i>	<i>Possible remedy</i>
Leaks in suction connections.	Tighten all hose connections on suction side of pump. Use pipe compound.
Suction hose leaks -----	Check hose for leaks.
Debris in pump -----	Remove debris from valves by taking off valve clean-out covers and accumulator (pars. 57-58). Reach through valve chambers and take out debris and flush valves and seats with water.
Valves are worn -----	Remove suction and discharge valves (pars. 57-58). Replace worn parts.
Pump is tilted -----	Place pump within 15° angle.
Suction strainer clogged	Remove debris from suction strainer. Free strainer from mud.

<i>Probable cause</i>	<i>Possible remedy</i>
Suction hose not properly submerged.	Have suction hose at least 4 to 5 feet below surface of water.
Pump not running fast enough.	Refer to TM 5-2805-206-14.
Clutch is worn -----	Clutch is slipping. Replace clutch segments (par. 59).

42. Pump Gear Drive or Cam Eccentric Running Hot

<i>Probable cause</i>	<i>Possible remedy</i>
Not the right amount of oil.	Drain or add oil to proper level on gear drive. Add oil to cam eccentric. Refer to lubrication order.
Pump is overloaded -----	The amount of solids being pumped is above 40 percent. Dilute liquid so that it is easier to pump. Lower discharge head. Do not exceed 25 feet.

43. Pump Stops Suddenly

<i>Probable cause</i>	<i>Possible remedy</i>
Pump is overloaded -----	Decrease the amount of solids being pumped. The amount of solids should not exceed 40 percent. Lower discharge head. Do not exceed 25 feet.
Clutch is worn -----	Repair clutch (par. 59).

Note. Refer to TM 5-2805-206-14 for radio interference suppression instructions.

Section VI. ENGINE REMOVAL AND ENGINE COMPONENTS

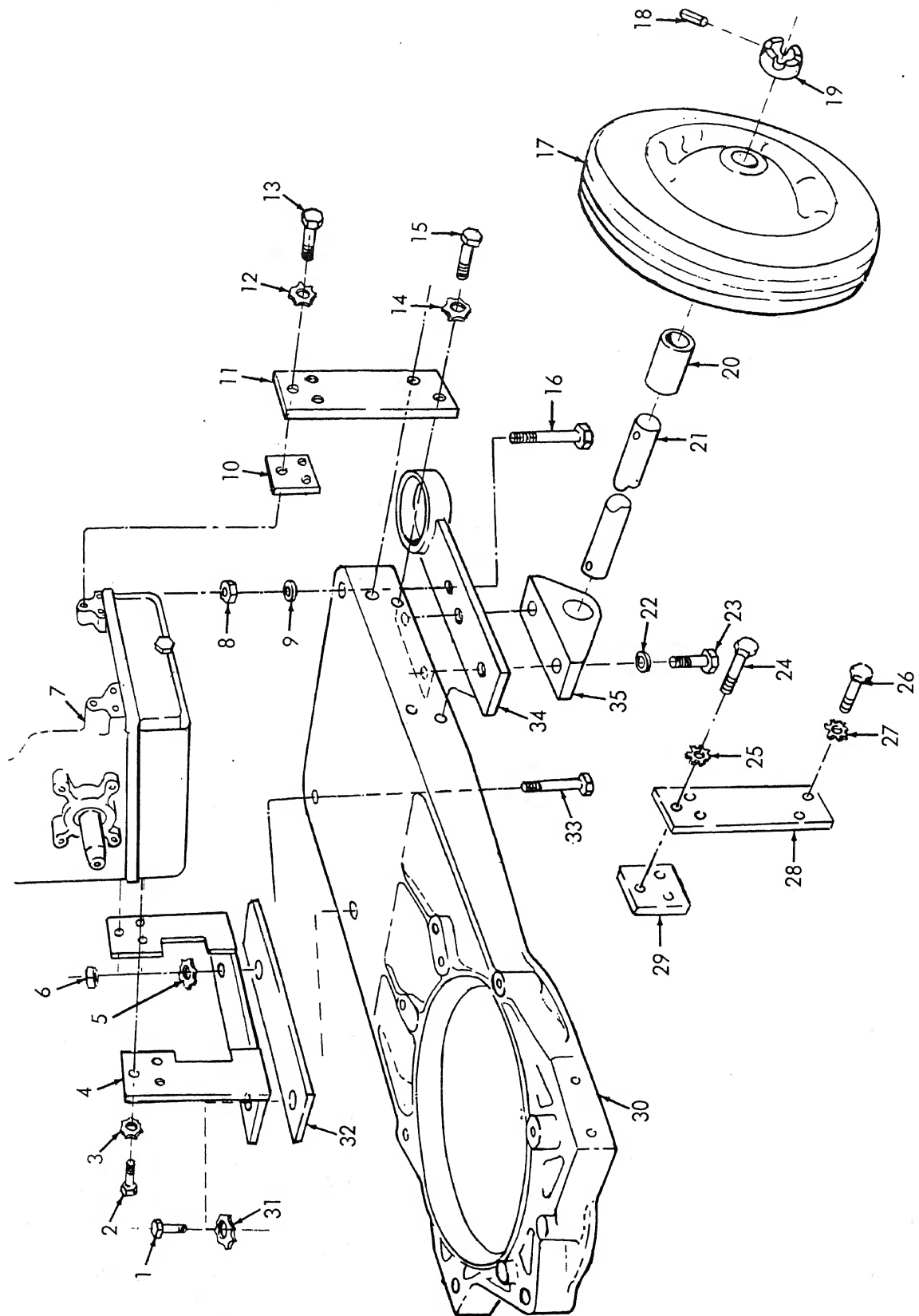
44. General

This section includes engine removal and maintenance instructions for the engine components that are not described in TM 5-2805-206-14. For operator and organizational engine maintenance, refer to TM 5-2805-206-14.

45. Engine and Brackets

a. Removal.

- (1) Remove the nut (6, fig. 18), washer (5), screw (33), screw (1) and washer (31) that secure the left engine bracket (4) and shim (32) to the frame (30).
- (2) Remove the 2 screws (15), washers (14), 2 screws (26), and washers (27) that secure the right front and rear engine brackets (11 and 28) to the frame (30).
- (3) Remove engine with brackets and remove shim (32) from frame (30).
- (4) Remove the six screws (2) and washers (3) that secure the left engine bracket (4) to the engine (7) and remove the bracket.
- (5) Remove the three screws (24) and washers (25) that secure the right front engine bracket (28) and shim (29) to engine (7). Remove the bracket and shim.
- (6) Remove the three screws (13) and washers (12) that secure the right rear engine bracket (11) and shim (10) to engine (7). Remove the bracket and shim.
- (7) Remove the clutch retainer from the engine shaft (par. 59).



1 Screw	11 Right rear engine bracket	20 Axle sleeve (2 rqr)	29 Shim
2 Screw (6 rqr)	12 Washer (3 rqr)	21 Axle	30 Frame
3 Washer (6 rqr)	13 Screw (3 rqr)	22 Washer (4 rqr)	31 Washer
4 Left engine bracket	14 Washer (2 rqr)	23 Bolt (4 rqr)	32 Engine shim
5 Washer	15 Screw (2 rqr)	24 Screw (3 rqr)	33 Screw
6 Nut	16 Screw (2 rqr)	25 Washer (3 rqr)	34 Rear hold down (2 rqr)
7 Engine	17 Wheel (2 rqr)	26 Screw (2 rqr)	35 Bracket (2 rqr)
8 Nut (2 rqr)	18 Pin (2 rqr)	27 Washer (2 rqr)	
9 Washer (2 rqr)	19 Cap (2 rqr)	28 Right front engine bracket	
10 Shim			

Figure 18—Continued.

b. Cleaning, Inspection, and Repair.

Note. For engine cleaning, inspection, and repair, refer to TM 5-2805-206-14.

- (1) Clean all other parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect brackets and shims for cracks and bends.
- (3) Inspect hardware for crossed threads and other damage.
- (4) Replace all parts beyond repair.

c. Installation.

- (1) Position the shim (10) and right rear engine bracket (11) on the engine (7) and secure the three washers (12) and screws (13).
- (2) Position the shim (29) and right front engine bracket (28) on the engine (7) and secure with three screws (24) and washers (25).
- (3) Position the left engine bracket (4) on the engine (7) and secure with six screws (2) and washers (3).
- (4) Install the clutch retainer on the engine shaft (par. 59).
- (5) Position the shim (32) and engine with mounting brackets on the frame (30). Push the engine forward until the clutch retainer is inside the clutch housing. Keep $\frac{1}{32}$ of an inch clearance between the clutch retainer and clutch housing around the complete diameter.
- (6) Secure the left engine bracket (4) and shim (32) to the frame (30) with screw (33), washer (5), nut (6), screw (1), and washer (31).
- (7) Secure the right front and rear engine brackets (11 and 28) to the frame (30) with 2 screws (15), washers (14), 2 screws (26) and washers (27).

46. Fuel Hose

a. Removal.

- (1) Remove the fuel tank drain plug (18, fig. 19) and drain the fuel from the fuel tank (1) in a suitable container.
- (2) Remove fuel hose (11) by separating union (10) and remove hose from fuel filter (12).
- (3) Remove union halves (10) from fuel hose (11) and the nipple (9).
- (4) Remove the nipple (9) from the fuel pump (8).

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the fuel hose for cracks, breaks, deterioration, and damaged hardware.
- (3) Replace all defective parts.

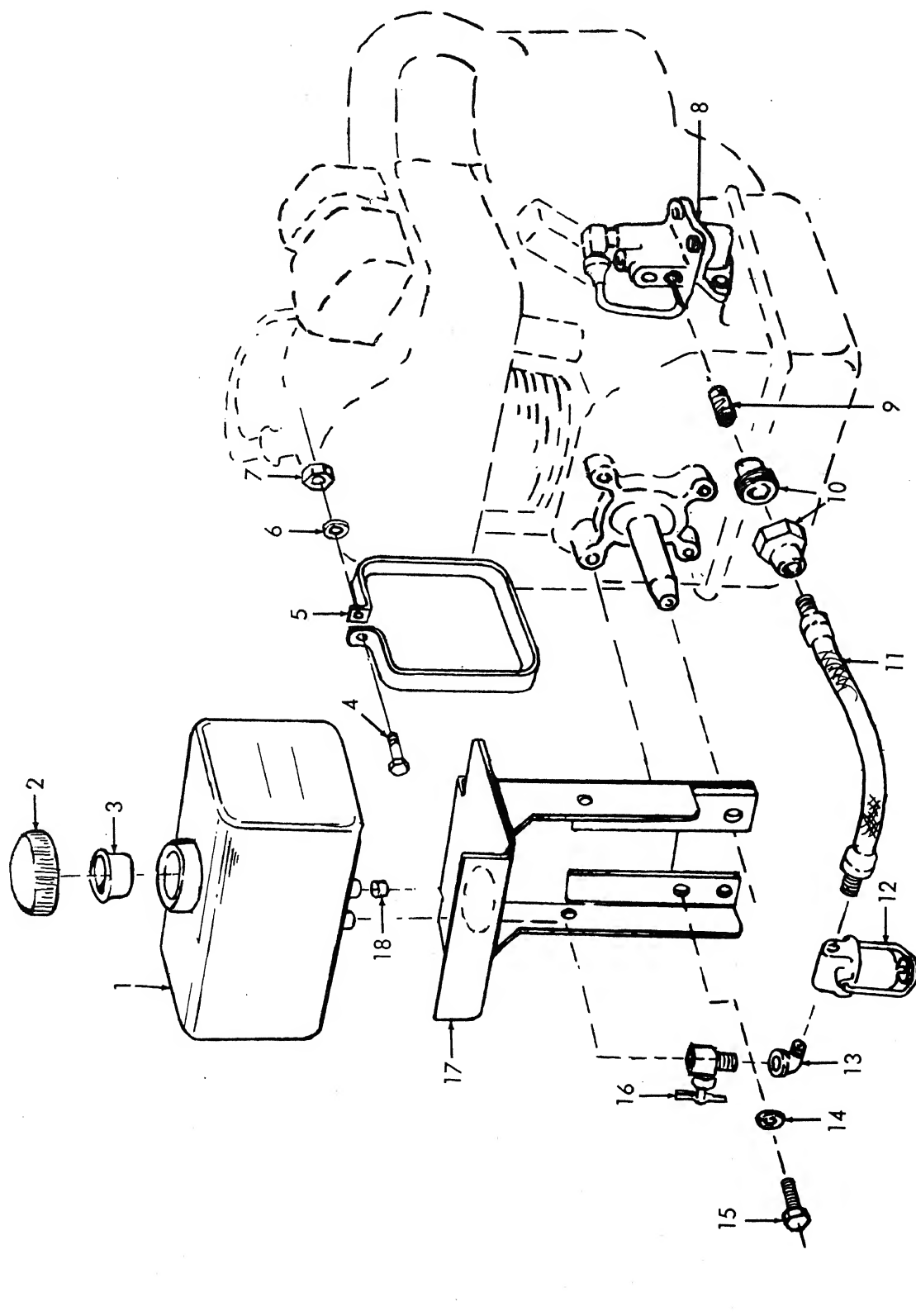
c. Installation.

- (1) Install nipple (9) in fuel pump (8).
- (2) Install union halves (10) on nipple (9) and fuel hose (11).
- (3) Install fuel hose on fuel filter (12) and secure with union halves.
- (4) Install the fuel tank drain plug (18) in the bottom of the fuel tank (1).

47. Fuel Filter

a. Removal.

- (1) Remove the fuel hose (par. 46).
- (2) Remove the fuel filter (12, fig. 19) as follows:
 - (a) Loosen the knurled nut on the bail to release the bail from the sediment bowl.
 - (b) Push bail to one side and remove bowl and gasket from fuel filter body.
 - (c) Remove the bail from fuel filter body and remove the fuel filter body from the elbow (13).



EMC 4320-222-15/19

- | | | | | | | | | | |
|---|----------------|---|-------------|----|-------------|----|----------------|----|-------------------|
| 1 | Fuel tank | 7 | Nut (2 rqr) | 10 | Union | 13 | Elbow | 16 | Shutoff valve |
| 2 | Cap | 8 | Fuel pump | 11 | Fuel hose | 14 | Washer (4 rqr) | 17 | Fuel tank bracket |
| 3 | Strainer | 9 | Nipple | 12 | Fuel filter | 15 | Bolt (4 rqr) | 18 | Plug |
| 4 | Screw (2 rqr) | | | | | | | | |
| 5 | Strap (2 rqr) | | | | | | | | |
| 6 | Washer (2 rqr) | | | | | | | | |

b. Cleaning and Inspection. Refer to TM 5-2805-206-14 for cleaning and inspection of the fuel filter.

c. Installation.

- (1) Install the fuel filter body on the elbow (13) and install the bail on the fuel filter body.
- (2) Position the gasket and sediment bowl on the fuel filter body and tighten the knurled nut on the bail.
- (3) Install the fuel hose (par. 46).

48. Fuel Shutoff Valve

a. Removal.

- (1) Remove the fuel filter (par. 47).
- (2) Remove the elbow (13, fig. 19) from the shutoff valve (16) and remove the shutoff valve from the fuel tank (1).

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect all parts for rust, corrosion, and damage.
- (3) Replace all damaged parts.

c. Installation.

- (1) Install the shutoff valve (15) on the fuel tank (1) and install the elbow (13) on the shutoff valve (16).
- (2) Install the fuel filter (par. 47).

49. Fuel Tank

a. Removal.

- (1) Remove the fuel shutoff valve (par. 48).
- (2) Remove the two nuts (7, fig. 19), washers (6), and screws (4) from the two fuel tank straps (5) and remove the straps from the fuel tank (1) and bracket (17).
- (3) Remove the fuel tank (1) from the bracket (17).

b. Disassembly.

- (1) Remove drain plug (18) from the bottom of the fuel tank (1).
- (2) Remove fuel tank cap (2) from the fuel tank (1).
- (3) Remove the fuel strainer (3) from the fuel tank.

c. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.

- (2) Inspect the fuel tank and straps for dents, tears, distorted areas, corrosion, and rust.

- (3) Straighten or repair any dents or tears in the tank straps.

- (4) Replace all parts beyond repair.

d. Reassembly.

- (1) Install the fuel strainer (3) in the fuel tank (1).

- (2) Install the fuel tank cap (2) on the fuel tank (1).

- (3) Install the drain plug (18) in the bottom of the fuel tank.

a. Installation.

- (1) Position the fuel tank on the fuel tank bracket (17).

- (2) Install the two fuel tank straps (5) on the fuel tank and fuel tank bracket and secure with the two screws (4), washers (6), and nuts (7).

50. Fuel Tank Bracket

a. Removal.

- (1) Remove the fuel tank (par. 49).

- (2) Remove the four bolts (15, fig. 19) and washers (14) from the fuel tank bracket (17) and remove the bracket from the engine.

b. Disassembly.

- (1) Remove the two nuts (4, fig. 20) and screws (3) from the name plate bracket (1) and the fuel tank bracket (2) and remove the name plate bracket from the fuel tank bracket.

- (2) Remove the four screws (6) that secure the name plate (5) to the name plate bracket (1) and remove the name plate.

c. Cleaning, Inspection, and Repair.

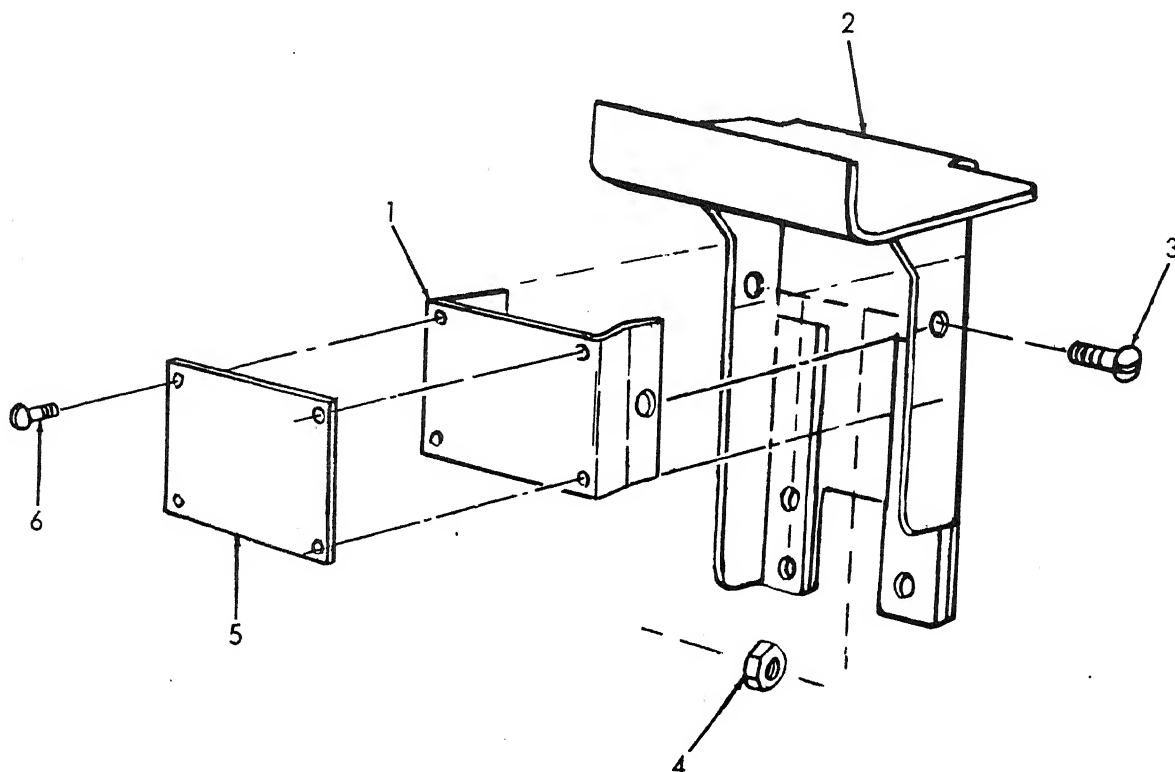
- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.

- (2) Inspect the bracket for dents and other damage.

- (3) Inspect hardware for crossed threads and other damage. Replace all parts beyond repair.

d. Reassembly.

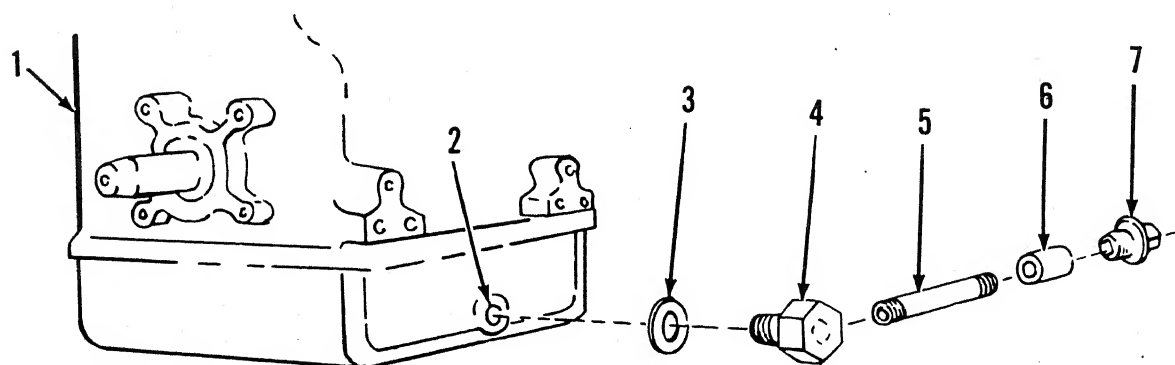
- (1) Position the name plate (5) on the name plate bracket (1) and secure with the four screws (6).



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- | | | |
|----------------------|-----------------|-----------------|
| 1 Name plate bracket | 3 Screw (2 rqr) | 5 Name plate |
| 2 Fuel tank bracket | 4 Nut (2 rqr) | 6 Screw (4 rqr) |

Figure 20. Name plate and bracket.



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- | | | | |
|------------------------|----------|------------|--------|
| 1 Engine | 3 Gasket | 5 Nipple | 7 Plug |
| 2 Engine drain opening | 4 Elbow | 6 Coupling | |

Figure 21. Engine crankcase drain, exploded view.

- (2) Position the name plate bracket (1) on the fuel tank bracket (2) and secure with the two screws (3) and nuts (4).

e. Installation.

- (1) Position the fuel tank bracket (17, fig. 19) on the engine and secure with four bolts (15) and washers (14).
- (2) Install the fuel tank (par. 49).

51. Engine Crankcase Drain

a. Removal.

- (1) Remove the plug (7, fig. 21) and drain the oil from the engine in a suitable container.
- (2) Remove coupling (6) from the nipple (5).
- (3) Remove the nipple (5) from the elbow (4).

- (4) Remove the elbow (4) and gasket (3) from the engine drain opening (2).

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect all parts for rust, corrosion, and crossed or damaged threads and gasket for deterioration. Replace all defective parts.

c. Installation.

- (1) Place the gasket (3) on the elbow (4) and install the elbow in the drain opening (2).
- (2) Install the nipple (5) in the elbow (4).
- (3) Install the coupling (6) on the nipple (5).
- (4) Install the plug (7) in the coupling (6).

Section VII. PUMP COMPONENTS

52. Pump Handle and Front Holddown

a. Removal.

- (1) Remove the two pins (4, fig. 22) from the handle sleeves (3) and remove the pump handle (2) from the sleeves.
- (2) Remove the 2 screws (5) and 2 washers (6) from the front holddown (16), handle sleeve (3), and pump frame (1) and remove the front hold down and handle sleeve from the pump frame.
- (3) Remove the remaining holddown and handle sleeve in a similar manner.

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect all parts for breaks, bends, and rust.
- (3) Repair breaks and straighten bends.
- (4) Replace all parts beyond repair.

c. Installation.

- (1) Position the handle sleeve (3) and front holddown (16) on the pump frame (1) and secure with the 2 washers (6) and 2 screws (5) to the pump frame (1).
- (2) Install the remaining holddown and handle sleeve in a similar manner.
- (3) Position the handle (2) in the handle sleeves (3) and install the two pins (4).

53. Wheels, Axles, and Brackets

a. Removal.

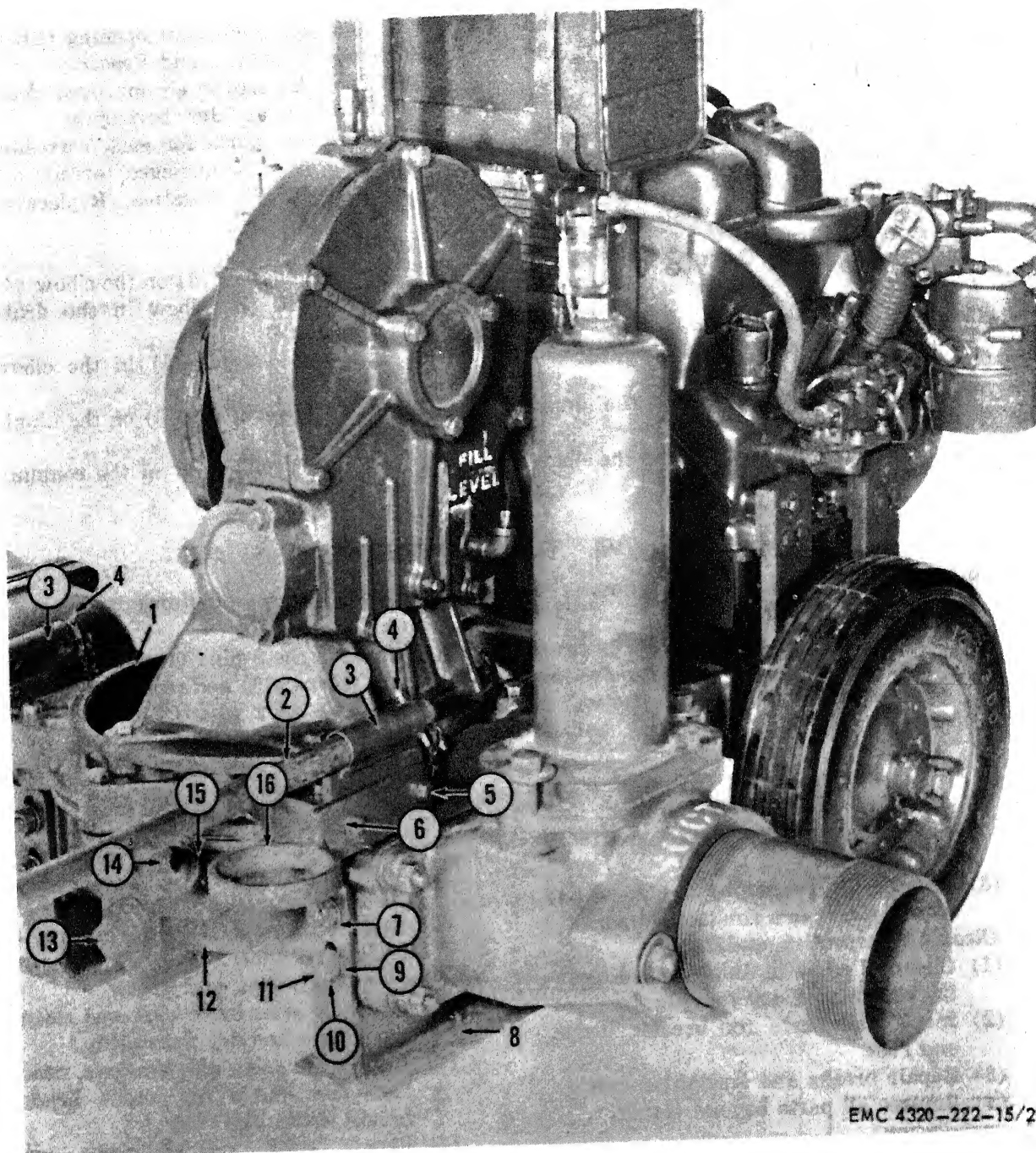
- (1) Remove the 2 pins (18, fig. 18) from the 2 caps (19) and remove the caps.
- (2) Remove the 2 wheels (17) and the 2 sleeves (20) from the axle (21).
- (3) Remove the axle (21) from the two brackets (35).
- (4) Remove the two bolts (23) and washers (22) from the axle bracket (35) and remove the axle bracket from the rear hold down (34).
- (5) Remove the remaining axle bracket in a similar manner.

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect the axles, axle brackets, bearings, and wheels for cracks, bends, breaks, dents, and rust.
- (3) Repair axles, axle brackets, and wheels or replace any parts beyond repair.
- (4) Inspect tires for breaks, cuts, deterioration, and badly worn condition.
- (5) Repair or replace all defective parts.

c. Installation.

- (1) Position the axle bracket (35) and the rear holddown (34) on the frame (30) and secure with two bolts (23) and washers (22).



- | | | | |
|-------------------------|-----------------------|-----------------|---------------------------|
| 1 Frame | 6 Washer (4 rqr) | 10 Nut (4 rqr) | 14 Fill plug |
| 2 Pump handle | 7 Flat washer (4 rqr) | 11 Stud (4 rqr) | 15 Elbow |
| 3 Handle sleeve (2 rqr) | 8 Stand (2 rqr) | 12 Bowl | 16 Front holddown (2 rqr) |
| 4 Handle pin (2 rqr) | 9 Lockwasher (4 rqr) | 13 Drain plug | |
| 5 Screw (4 rqr) | | | |

Figure 22. Pump handle and stand, removal points.

- (2) Install the remaining axle bracket in a similar manner.
- (3) Position the axle (21) in the two axle brackets (35).
- (4) Position the 2 sleeves (20), 2 wheels (17), and the 2 caps (19) on the axle (21) and secure with the 2 pins (18).

54. Rear Holddowns

a. Removal.

- (1) Remove the axle bracket (par. 53).
- (2) Remove the nut (8, fig. 18), washer (9), and screw (16) from the rear holddown (34) and frame (30) and remove the rear holddown from the frame.
- (3) Remove the remaining holddown in a similar manner.

b. Cleaning, Inspection, and Repair.

- (1) Clean the rear holddown in an approved cleaning solvent and dry thoroughly.
- (2) Inspect the rear holddown for breaks, cracks, bends, dents, and rust.
- (3) Straighten bends, dents, repair breaks and remove rust.
- (4) Replace a part that is beyond repair.

c. Installation.

- (1) Position the rear holddown (34) on the frame (30) and secure with the screw (16), washer (9), and nut (8).
- (2) Install the axle bracket (par. 53).
- (3) Install the remaining holddown in a similar manner.

55. Cam Drive Oiler

a. *Removal.* Remove the cam drive oiler (8, fig. 17) from the cam housing (7) by turning counterclockwise.

b. *Cleaning, Inspection, and Repair.* Clean the cam drive oiler with an approved cleaning solvent and dry thoroughly. Inspect the lubricator for leaks and broken parts. Replace unserviceable cam.

c. Installation.

- (1) Install the cam drive oiler (8) on the cam housing (7).
- (2) Fill the cam drive oiler with oil as specified in the current lubrication order.

56. Lifting Eyebolt

a. *Removal.* Remove the lifting eyebolt (2, fig. 4) by inserting a bar through the eye and turning counterclockwise. Remove lifting eyebolt (2) and washer (7) from the gearcase (6).

b. *Cleaning, Inspection, and Repair.* Clean the lifting eyebolt in an approved cleaning solvent and dry thoroughly. Inspect the lifting eyebolt for distortion, cracks, and rust. Remove rust, straighten distortion, and repair cracks. Replace unserviceable lifting eyebolt.

c. *Installation.* Install the lifting eyebolt (2) and washer (7) on the gearcase (6) and turn clockwise until secure.

57. Pump Suction Valve

Note. Suction and discharge valve parts are interchangeable and can be placed on either side of pump. Always use suction accumulator on suction side of pump and valve extension on discharge side of pump.

a. Removal.

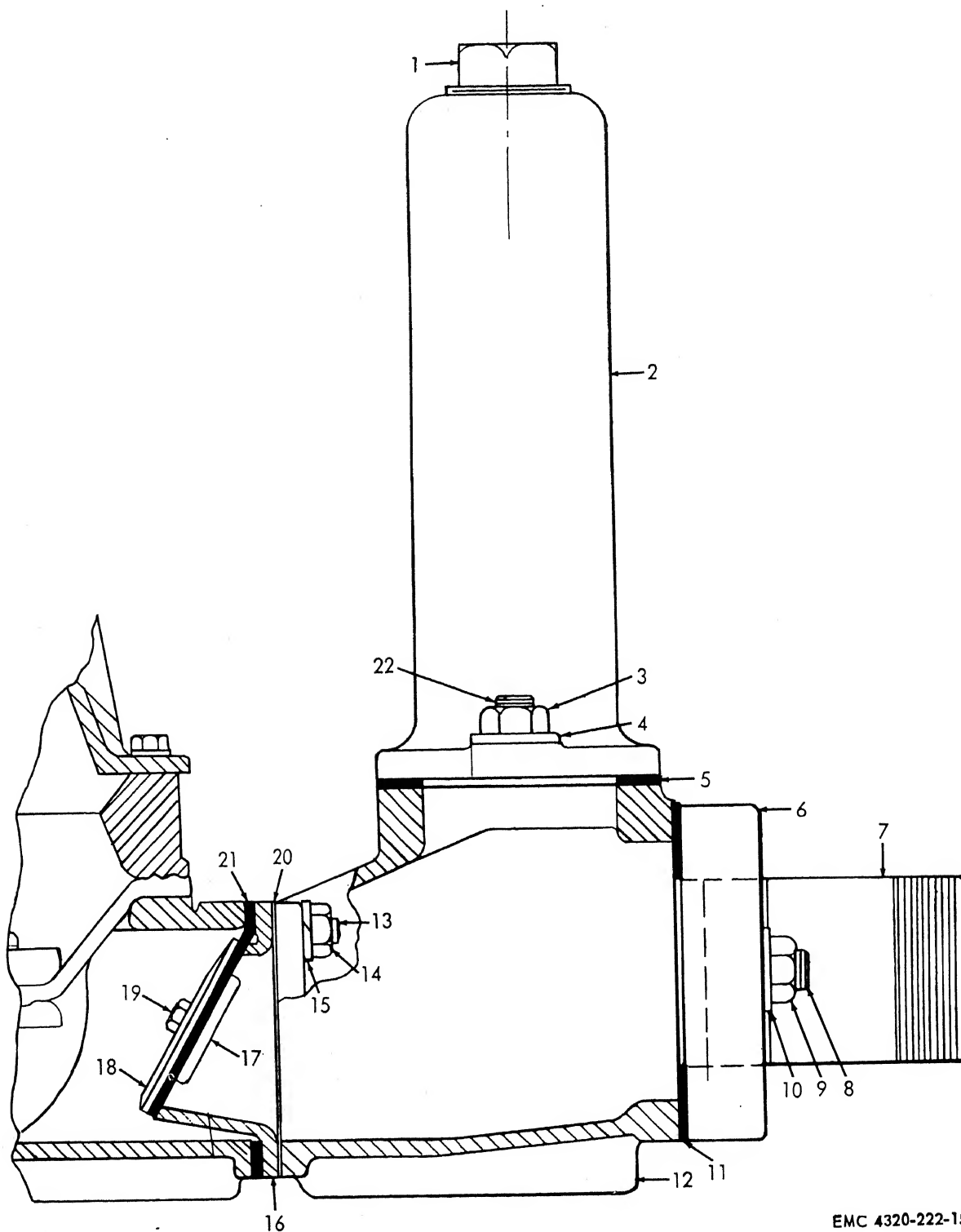
- (1) Remove the two nuts (9, fig. 23) and washers (10) and remove adapter (6) and gasket (11) from the studs (8).
- (2) Remove the two nuts (3) and washers (4) from the studs (22) and remove the accumulator (2) and gasket (5) from the valve body (12).
- (3) Remove the four nuts (14) and washers (15) from the studs (13) and remove valve body (12), check valve (21), with weights (17 and 18), valve seat (16), and gasket (20) from the pump bowl studs (13).
- (4) Remove two screws (19) from small weight (17), check valve (21), and large weight (18) and remove the weights from the check valve.

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts except the check valve in an approved cleaning solvent and dry thoroughly.
- (2) Inspect valve body and accumulator for cracks or holes. Inspect valve seat face to see that they are smooth and flat. Inspect the check valve for holes, cuts or tears. Repair or replace all defective parts.

c. Installation.

- (1) Position small weight (17) and large weight (18) on the check valve (21) and secure with the two screws (19).



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Figure 23. Suction valve.

1 Plug	7 Nipple	13 Stud (2 rqr)	18 Weight (large)
2 Accumulator	8 Stud (2 rqr)	14 Nut (2 rqr)	19 Screw (2 rqr)
3 Nut (2 rqr)	9 Nut (2 rqr)	15 Washer (2 rqr)	20 Gasket
4 Washer (2 rqr)	10 Washer (2 rqr)	16 Valve seat	21 Check valve
5 Gasket	11 Gasket	17 Weight (small)	22 Stud (2 rqr)
6 Adapter	12 Valve body		

Figure 23—Continued.

- (2) Position the check valve on the pump bowl studs (13) with large weight (18) toward pump bowl.
- (3) Position valve seat (16) with seat toward pump bowl.
- (4) Position seat gasket (20) on the valve seat.
- (5) Position valve body (12) on studs (13) and secure with washers (15) and nuts (14).
- (6) Position the gasket (5) on valve body (12).
- (7) Position the accumulator (2) on studs (22) and gasket (5). Be sure that gasket is properly placed. Secure accumulator to valve body (12) with two washers (4) and nuts (3).
- (8) Position adapter gasket (11) on valve body (12) and position the adapter (6) on the studs (8) and gasket (11) and secure adapter to valve body (12) with washers (10) and nuts (9).

58. Pump Discharge Valve and Valve Extension

a. Removal.

- (1) Remove the two nuts (24, fig. 24) and washers (23) and remove the adapter (2) and gasket (22) from the studs (25).
- (2) Remove two nuts (6) and washers (5) from studs (7) and remove cover (4) and gasket (3) from valve body (21).
- (3) Remove the four nuts (15) and washers (16) from the studs (20) and remove valve body (21), check valve (11) with weights (9 and 10), two valve seats (12), and two gaskets (19) from the valve extension (13).
- (4) Remove the two screws (8) and washers (26) from the small weight (10), check valve (11), and large weight (9) and remove the weights from the check valve.
- (5) Remove the four nuts (15) and washers (16) from the studs (14) and

remove the valve extension (13) and gasket (19) from the pump bowl (18).

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect the valve body for cracks or holes. Inspect valve seat face to see that they are smooth and flat. Inspect the check valve for holes, cuts or tears. Repair or replace all defective parts.

c. Installation.

- (1) Position the gasket (19) on pump bowl (18) and position the valve extension (13) on the studs (14). Be sure gasket (19) is placed properly and secure valve extension to the bowl with four washers (16) and nuts (15).
- (2) Position valve seat gasket (19) and valve seat (12) with seat facing toward pump on valve extension studs (20).
- (3) Position a second valve seat gasket (19) and valve seat (12) with seat facing out from pump on the valve extension studs (20).
- (4) Position large weight (9) and small weight (10) on check valve (11) and secure with the two screws (8) and washers (26).
- (5) Position check valve (11) on valve seat (12) with large weight (9) facing out.
- (6) Position valve body (21) on valve extension studs (20) and over valve seat (12) and check valve (11). Be sure valve seats properly and secure valve body (21) with four washers (16) and nuts (15) to valve extension (13).
- (7) Position clean out cover gasket (3) and clean out cover (4) on valve body (21). Be sure that gasket is properly placed and secure cover (4) with washers (5) and nut (6) to the valve body.

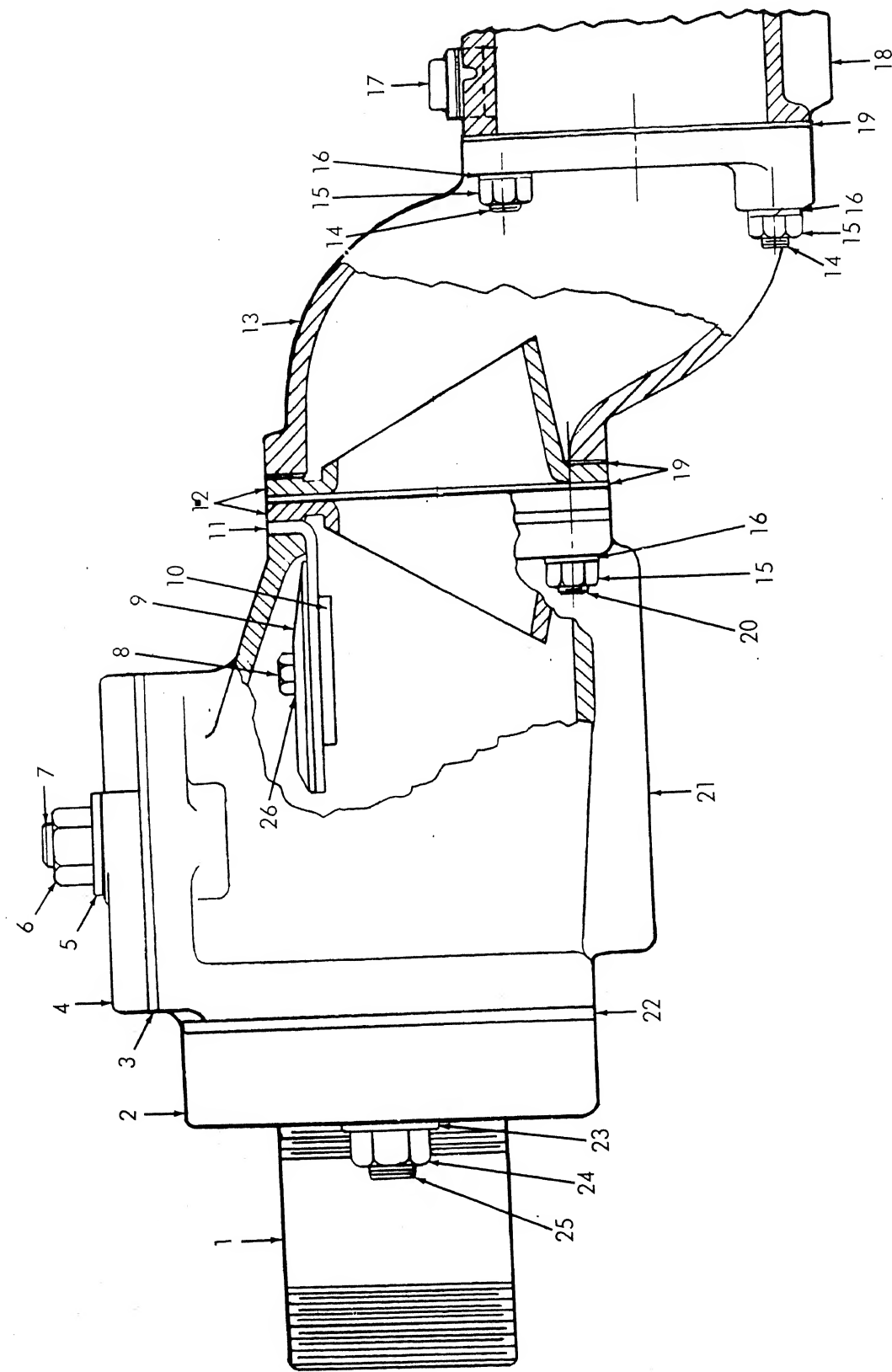


Figure 24. Discharge valve.

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1 Nipple	8 Screw (2 rqr)	15 Nut (4 rqr)	21 Valve body
2 Adapter	9 Weight (large)	16 Washer (4 rqr)	22 Gasket
3 Gasket	10 Weight (small)	17 Plug	23 Washer (2 rqr)
4 Cover (clean out)	11 Check valve	18 Bowl	24 Nut (2 rqr)
5 Washer (2 rqr)	12 Valve seat (2 rqr)	19 Gasket (3 rqr)	25 Stud (2 rqr)
6 Nut (2 rqr)	13 Valve extension	20 Stud (4 rqr)	26 Washer (2 rqr)
7 Stud (2 rqr)	14 Stud (4 rqr)		

Figure 24—Continued.

- (8) Position the adapter gasket (22) and adapter (2) on the studs (25). Be sure gasket (22) is properly placed and secure the adapter with washer (23) and nuts (24) to the valve body (21).

59. Clutch Coupling

a. Removal.

- (1) Remove engine (par. 45).
- (2) Remove setscrew (2, fig. 25) from clutch retainer (10) and remove retainer and key (1) from the engine shaft (11).
- (3) Remove setscrew (4) in clutch housing (8) and remove housing from pump shaft (6).

- (4) Remove sleeve (7) and key (5) from the pump shaft (6).

- (5) Remove spring (9) and the four segments (3) from the clutch retainer (10).

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect clutch driving half and driven half for damage. Inspect spring and segments for damage.
- (3) Repair or replace all unserviceable parts.

c. Installation.

- (1) Position the four segments (3) in the clutch retainer (10) and secure with the spring (9).

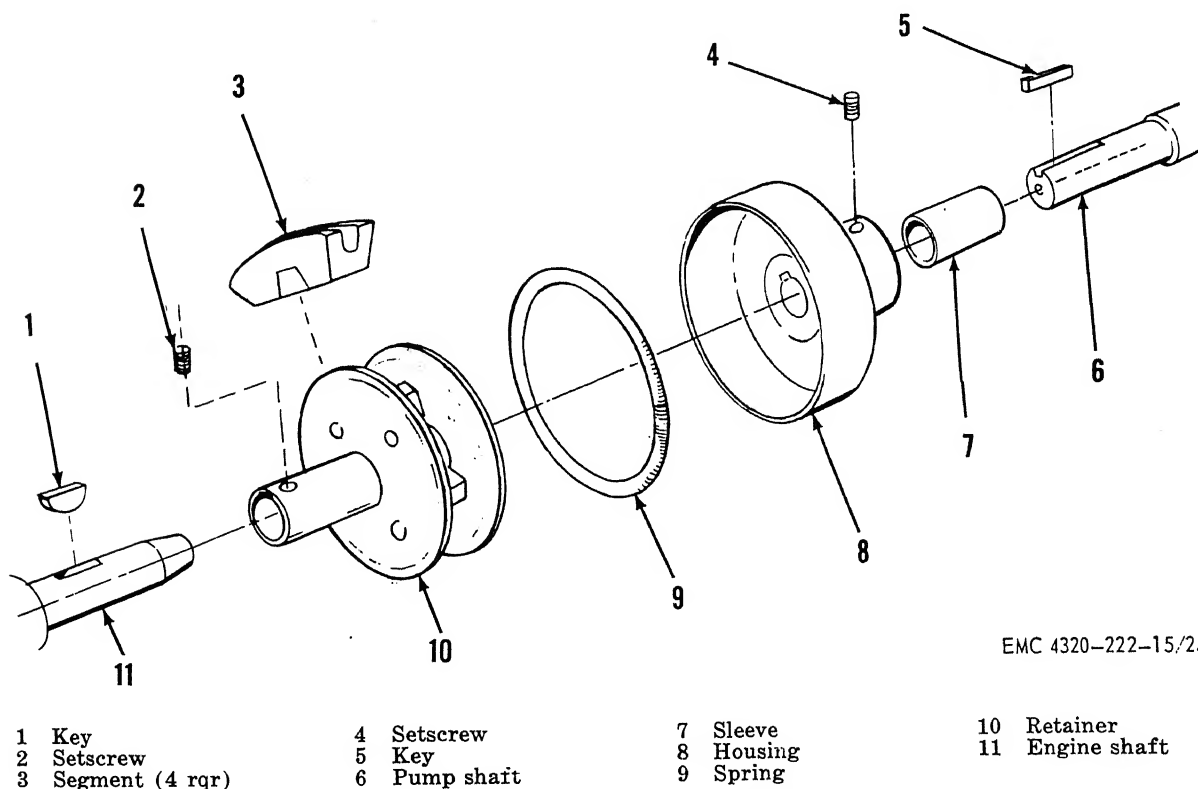


Figure 25. Clutch coupling, exploded view.

- (2) Position key (1) on the engine shaft (11).
- (3) Install clutch retainer (10) on engine shaft (11) with extended sleeve toward engine and against shaft shoulder and secure with setscrew (2).
- (4) Install key (5), sleeve (7), and clutch housing (8) on the pump shaft (6) with extended bore against sleeve and secure with setscrew (4).
- (5) Install engine (par. 45). Position engine so that clutch retainer (10) lines up with clutch housing (8) on pump shaft (6). Keep $\frac{1}{32}$ of an inch clearance for complete diameter.

60. Pump Stands

a. Removal.

- (1) Remove the four nuts (10, fig. 22),

lockwashers (9), and washers (7) from the studs (11) and remove the pump stand (8) from the bowl (12).

- (2) Remove the remaining stand in the same manner.

b. Cleaning, Inspection, and Repair.

- (1) Clean the stands with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the stands for cracks, breaks or other damage.
- (3) Repair cracks and breaks or replace stands beyond repair.

c. Installation.

- (1) Position the pump stand (8) on the pump bowl (12) and secure with two washers (7), lockwashers (9), and nuts (10).
- (2) Install the remaining pump stand in the same manner.

CHAPTER 4

DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

61. General

When capture or abandonment of the reciprocating pump to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all reciprocating pumps and all corresponding repair parts.

62. Demolition To Render Pump Inoperative

a. Mechanical Means. Use sledge hammers, crowbars, picks, axes, or any other heavy tools available to destroy the pump.

b. Misuse. Add sand or dirt to the engine crankcase and run engine until it fails.

63. Other Demolition Methods

a. Scattering and Concealment. Remove all easily accessible parts from the engine such as the carburetor, air cleaner, and fuel pump and scatter them through dense foliage, bury them in sand or dirt, or throw them in a lake, stream, or other body of water. Bury the pump in sand or dirt. Conceal it in dense foliage or throw it into a lake, stream or other body of water.

b. Burning. Pack rags, clothing, or canvas under and around the pump and engine. Saturate this packing with gasoline, oil, or diesel fuel and ignite.

c. Submersion. Remove the spark plugs and engine crankcase fill and level gage. Remove the oil drain plug from the gearcase and the water drain and fill plugs from the pump bowl.

Completely submerge the unit in a body of water to provide water damage and concealment. Salt water will do greater damage to metal parts than fresh water.

64. Demolition by Explosives or Weapons Fire

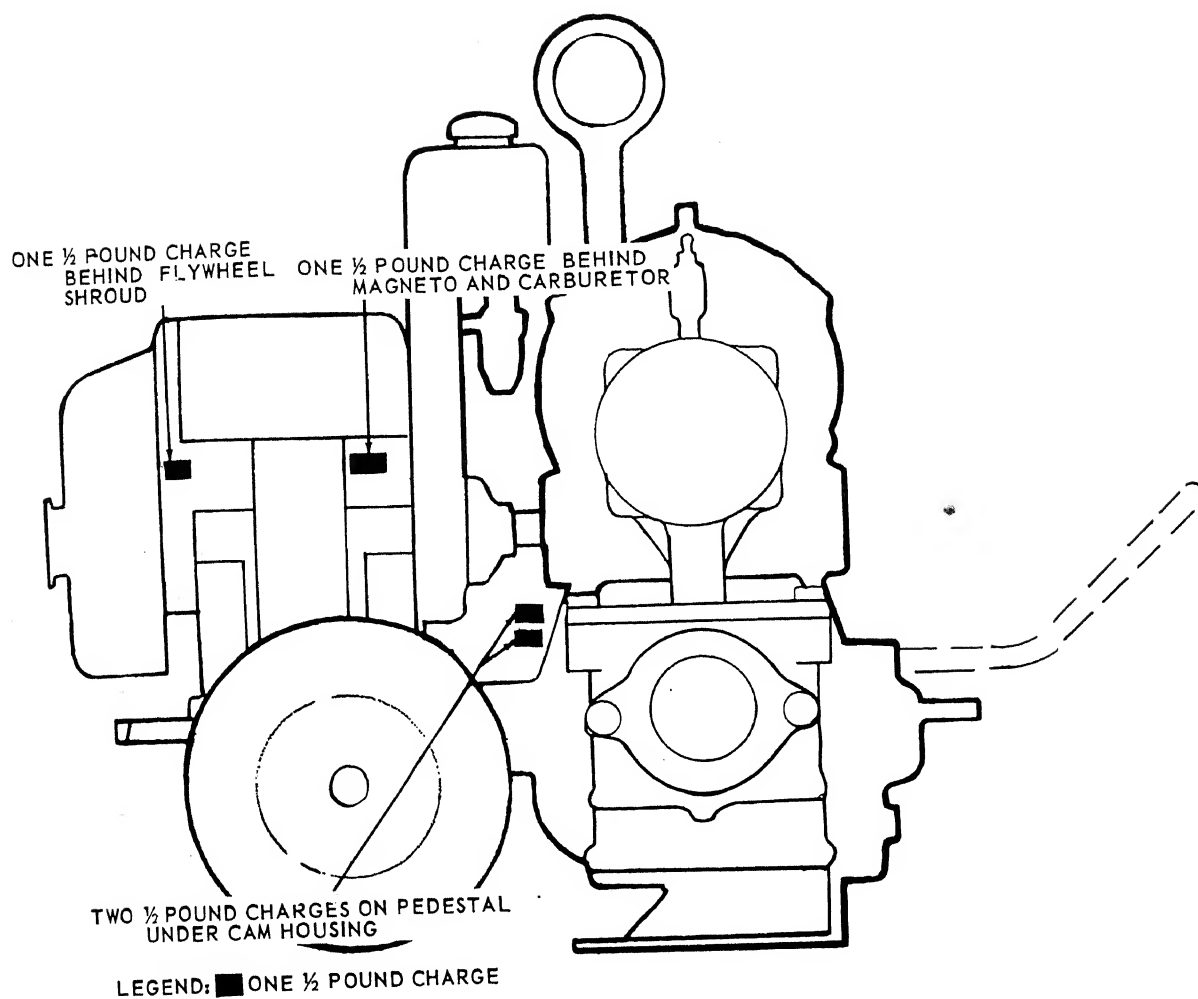
a. Explosives. Place as many of the following charges (fig. 26) as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator.

- (1) One $\frac{1}{2}$ pound charge against the block behind the flywheel shroud.
- (2) One $\frac{1}{2}$ pound charge behind magneto and carburetor.
- (3) Two $\frac{1}{2}$ pound charges against pedestal under cam housing.

b. Weapons Fire. Fire on the unit with the heaviest practical weapon available. Direct fire at both the engine and pump.

65. Training

All operators should receive thorough training in the destruction of the reciprocating pump. Refer to FM 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training, that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.



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Figure 26. Placement of charges.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE

Section I. SHIPMENT WITHIN ZONE OF INTERIOR

66. Preparation of Equipment For Shipment

- a. Drain the fuel tank (par. 46).
- b. Empty and clean the air cleaner and fuel filter (TM 5-2805-206-14).
- c. Crate the reciprocating pump using the shipping dimensions shown in figure 5. Refer to TM 9-200 for packaging instructions.

67. Loading Equipment For Shipment

Load the reciprocating pump on the carrier using a suitable lifting device, or manpower. The unit must be kept right side up when handling. Block or tie it to the bed of the carrier to prevent shifting while it is being transported.

Caution: When tying the pump to a carrier, pass the bands through frame. Do not secure by banding across the channels.

Section II. LIMITED STORAGE

68. Preparation of Equipment For Storage

a. *General.* Limited storage is defined as a period not to exceed 6 months. Detailed instructions for the preparation of equipment for limited storage are listed in this paragraph. Refer to AR 743-505 for additional information.

b. *Inspection.* Make a complete inspection of the reciprocating pump as described in paragraph 8. Correct all deficiencies.

c. *Cleaning and Painting.*

- (1) Clean all the surfaces of the reciprocating pump that can be reached without disassembly.
- (2) Blow out the cooling fins on the engine with compressed air.
- (3) Remove all grease, rust, and other corrosion.
- (4) Clean all surfaces where the paint film has been damaged and repaint as instructed in TM 9-2851.

d. *Protection and Weatherproofing.* When the reciprocating pump is stored outdoors, place the unit on boards so that it will be off the ground. Install a canvas cover or other weatherproof covering and provide adequate room for inspection and servicing.

e. *Lubrication.* Lubricate the engine in accordance with the current lubrication order and TM 5-2805-206-14.

69. Inspection and Maintenance of Equipment in Storage

a. *Inspection.* When equipment has been placed in storage, all scheduled preventive maintenance service including inspection will be suspended and preventive maintenance inspection will be performed as specified herein. Refer to AR 743-505.

b. *Worksheet and Preventive Maintenance.* DA Form 464 will be executed on each major item of equipment when equipment is initially placed in limited storage and every 30 days thereafter. Required maintenance will be performed promptly to insure that the equipment is mechanically sound and ready for immediate use.

c. *Operation.* Equipment in limited storage must be operated long enough to bring it up to operating temperature and for complete lubrication of all bearings, gears, and so on, at least every 30 days. Equipment must be serviced and in satisfactory operating condition before it is operated.

CHAPTER 6

FIELD AND DEPOT MAINTENANCE REPAIR INSTRUCTIONS

Section I. GENERAL

70. Scope

a. The following instructions are provided for the use of field and depot maintenance personnel. They contain information on the maintenance of the equipment which is beyond the scope of the tools, equipment, personnel, or supplies normally available to organizational maintenance facilities.

b. Appendix I contains a list of all publications applicable to field and depot maintenance

facilities for this equipment. Appendix II contains the maintenance allocation chart.

71. Field and Depot Maintenance Record and Report Forms

For record and report forms applicable to third, fourth, and fifth echelons of maintenance, refer to TM 5-505.

Note. Applicable forms, excluding Standard Form 46 which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

72. Description

For a complete description of the reciprocating pump, refer to paragraph 3.

73. Field and Depot Maintenance Tabulated Data

a. For tabulated data on the engine, refer to TM 5-2805-206-14.

b. The pump repair and replacement standards are listed in table IV.

Table IV. Pump Repair and Replacement Standards

	Manufacturer's dimensions and tolerances in inches		Desired clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max.	
Cam diameter---	5.743	5.745			.020 over Mfg's original tolerance.
Clearance limits-----			.008	0.012	
Cam bearing-----	5.753	5.757			
End play-----	0.005	0.014			

Section III. SPECIAL TOOLS AND EQUIPMENT

74. Special Tools and Equipment

No special tools or equipment are required by field and depot maintenance personnel for performing maintenance on the pump.

75. Field and Depot Maintenance Repair Parts

Field and depot maintenance repair parts are listed and illustrated in TM 5-4320-222-25P.

76. Specially Designed Tools and Equipment

No specially designed tools or equipment are required by field and depot maintenance personnel for performing maintenance on the pump.

Section IV. TROUBLESHOOTING

77. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the pump and its components. Each trouble symptom stated is fol-

lowed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. For troubleshooting the engine refer to TM 5-2805-206-14.

Pump Gearcase Runs Hot When Fully Lubricated

<i>Probable cause</i>	<i>Possible remedy</i>
Bearings too tight -----	Add proper number of gaskets (shims) between bearing covers on gearcase (par. 83).

79. Pump Has No Discharge Pressure

<i>Probable cause</i>	<i>Possible remedy</i>
Diaphragm defective -----	Replace defective diaphragm (par. 80).
Pump bowl cracked or broken.	Replace defective pump bowl (par. 82).
Debris in pump -----	Remove debris from pump bowl by detaching bowl from frame (par. 82).

Section V. PUMP REPAIR INSTRUCTIONS

80. Diaphragm and Clamp Plate

a. Removal.

- (1) Position pump diaphragm (6, fig. 27) in the down position by turning the clutch housing (8, fig. 25).
- (2) Remove the six screws (1, fig. 27) and washers (2) from the frame (10) and bowl (7) and remove the bowl.
- (3) Tilt the pump frame back as shown in figure 27.
- (4) Remove the four nuts (3) and washers (4) from the top of connecting rod plate (5) and studs (9).
- (5) Remove diaphragm clamp plate (8) and diaphragm (6).

Note. Remove stud (9) from plate (8) if damaged.

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect clamp plate for breakage or holes and corrosion.
- (3) Inspect diaphragm for cuts, holes or cracks. Replace all unserviceable parts.

c. Installation.

- (1) Position the diaphragm (6) with inside shoulder of diaphragm facing up on clamp plate (8).
- (2) Position diaphragm (6) and diaphragm plate (8) on connecting rod plate (5). Be sure the inside shoulder of diaphragm fits snug into connecting rod plate and secure with the four nuts (3) and washers (4) to the connecting rod plate (5) and studs (9).
- (3) Place pump frame (10) down with diaphragm (6) between frame and pump bowl (7).
- (4) Install the six screws (1) and washers (2) securing the frame (10), diaphragm (6), and bowl (7) together.

81. Cam Eccentric and Connecting Rod Assembly

a. Removal.

- (1) Remove the diaphragm (par. 80).
- (2) Remove the cam drive oiler (2, fig. 28) from the cam housing (1).
- (3) Remove the four screws (9) and washers (10) from the cam housing ring (6) and remove the cam housing with connecting rod assembly (11 thru 16) from the cam (3).
- (4) Loosen the setscrew (4) and remove the cam (3), gasket (5), cam housing ring (6), and key (7) from the shaft (8).

b. Disassembly.

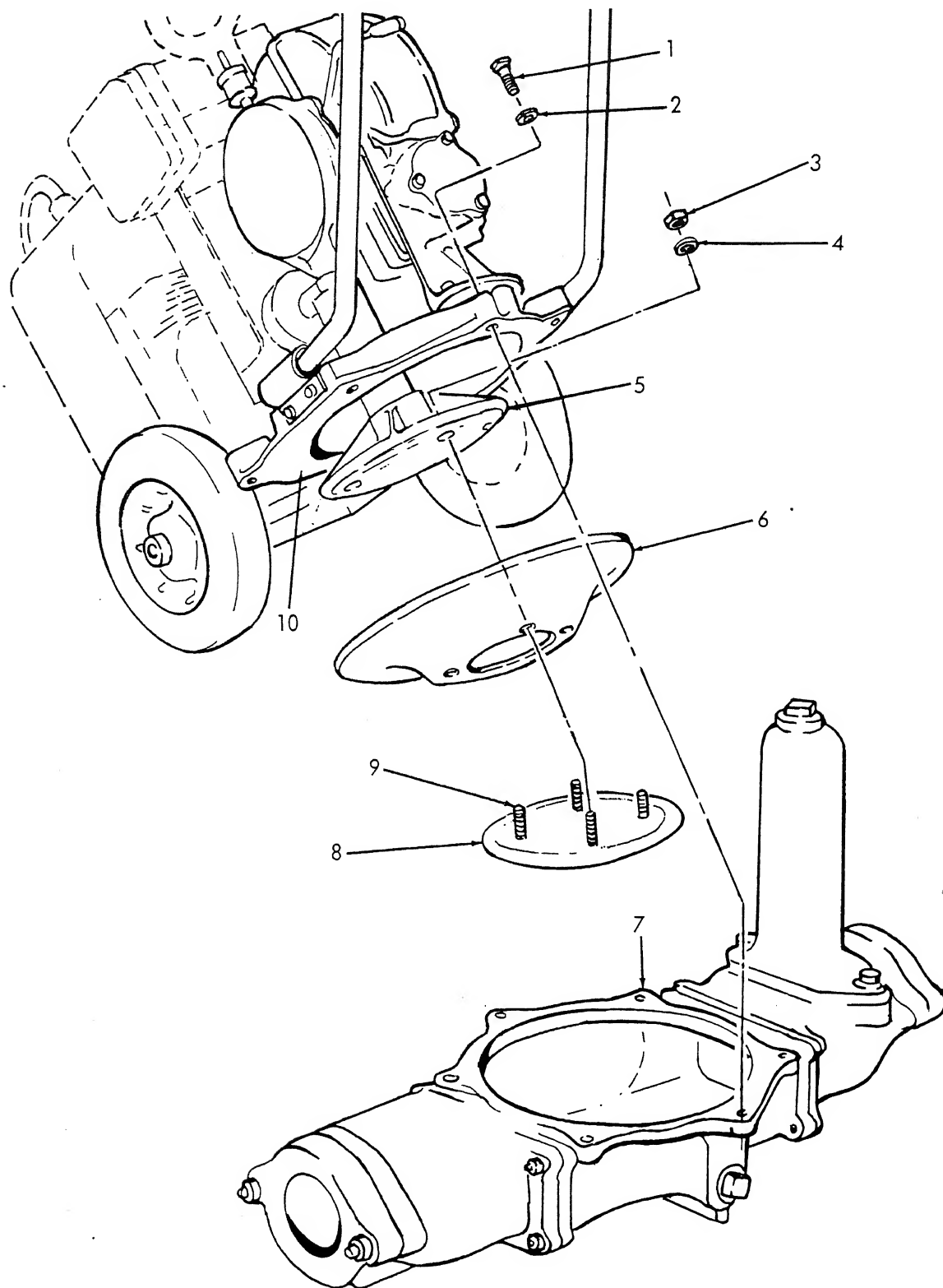
- (1) Remove connecting rod (16) from cam housing (1).
- (2) Remove nut (11), washer (12), washer (13), spacer (14), and connecting rod plate (15) from connecting rod (16).

c. Cleaning, Inspection, and Repair.

- (1) Clean all parts in an approved cleaning solvent and dry thoroughly.
- (2) Inspect all metal parts for cracks, breaks, rust, and gasket for deterioration and tears. Inspect the parts for proper clearance as shown in table IV. Repair or replace all unserviceable parts.

d. Reassembly.

- (1) Install connecting rod plate (15), spacer (14) and washer (13) on connecting rod (16) and secure with washer (12) and nut (11).
- (2) Screw assembled connecting rod (11-16) in cam housing (1). Connecting rod will be the proper length when nut (11) is tight against the cam housing.



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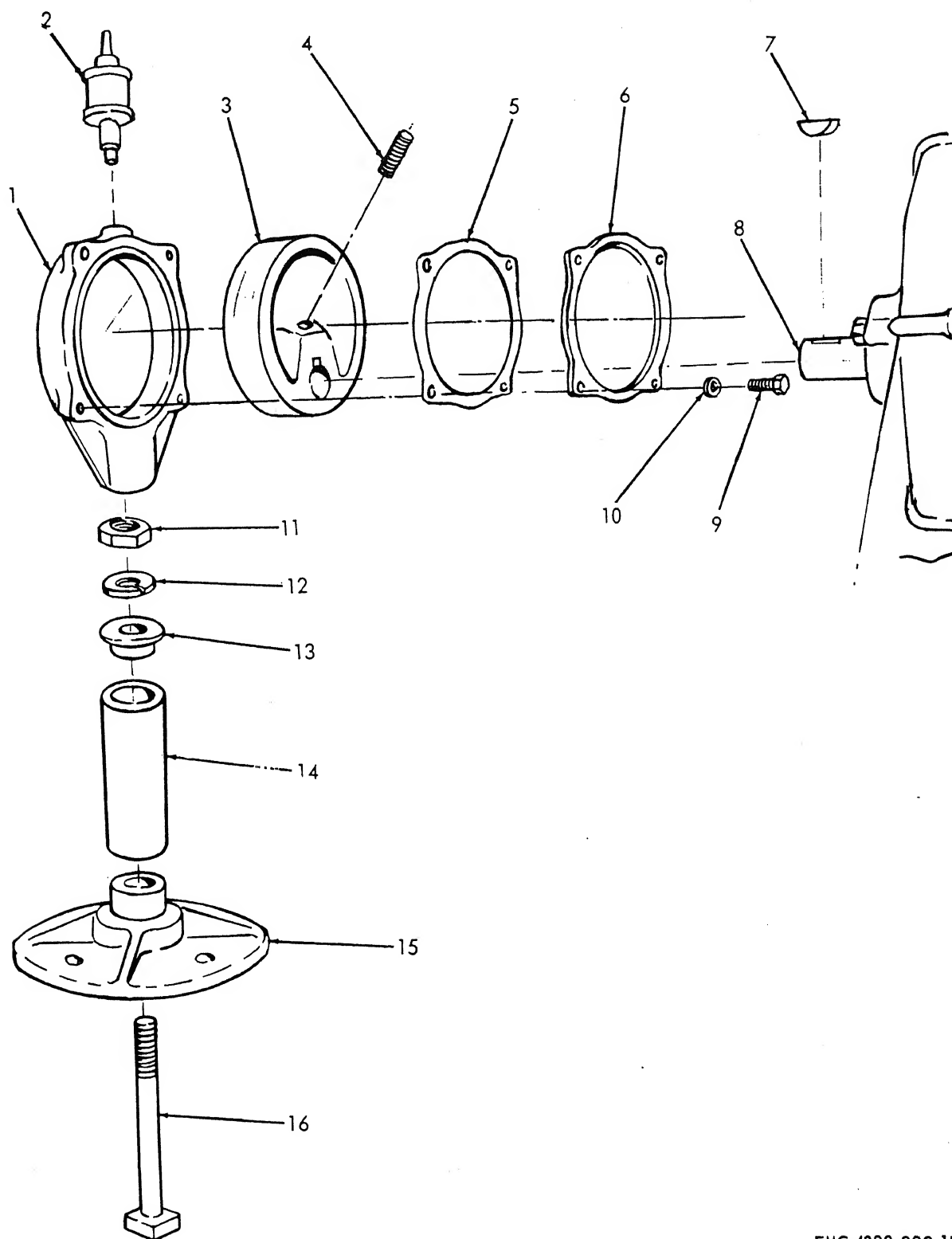
1 Screw (6 rqr)
2 Washer (6 rqr)
3 Nut (4 rqr)

4 Washer (4 rqr)
5 Plate
6 Diaphragm

7 Bowl
8 Clamp plate

9 Stud (4 rqr)
10 Frame

Figure 27. Diaphragm, removal



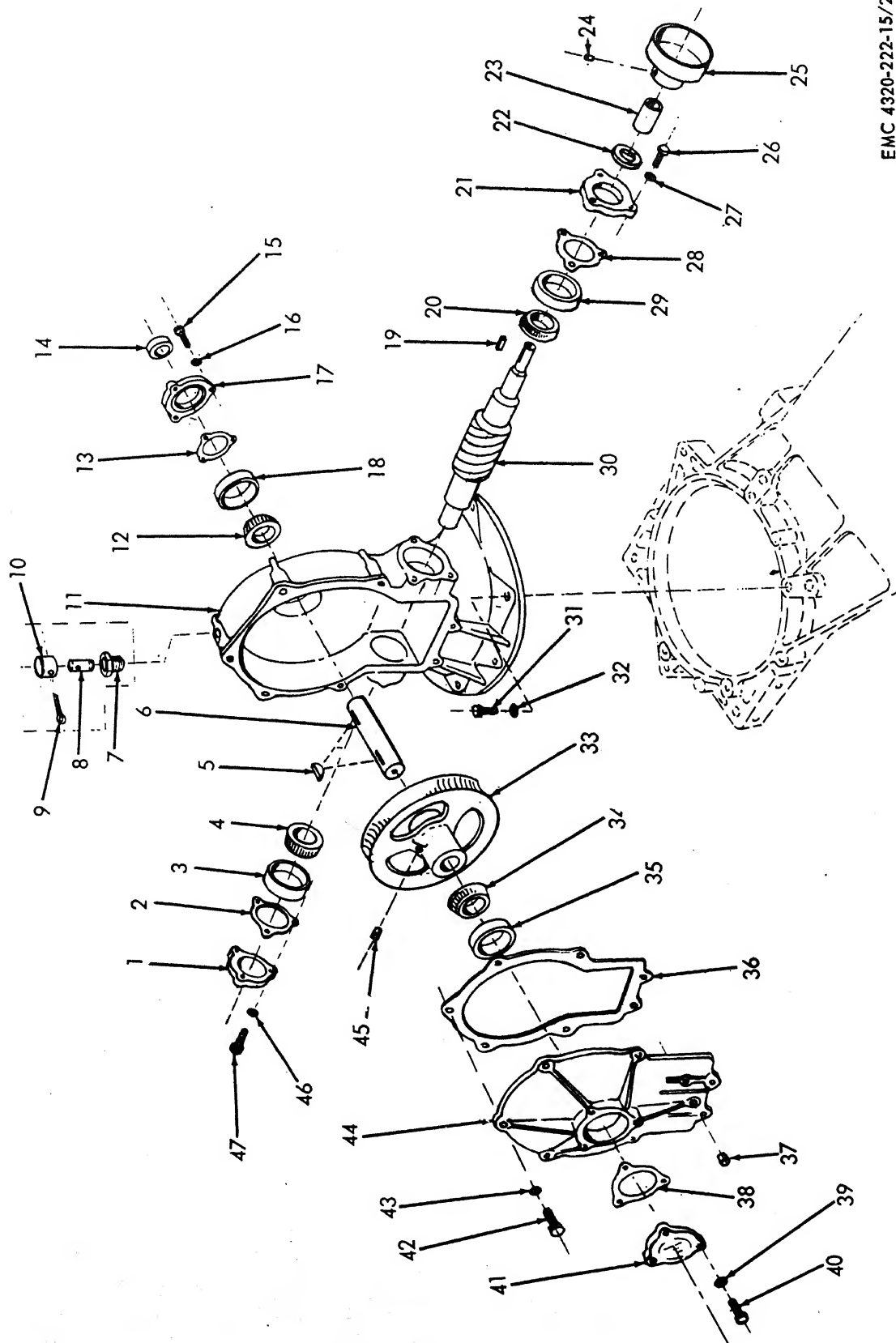
1 Cam housing
2 Cam drive oiler
3 Cam
4 Setscrew

5 Gasket
6 Cam housing ring
7 Key
8 Shaft

9 Screw (4 rqr)
10 Washer (4 rqr)
11 Nut
12 Washer

13 Washer
14 Spacer
15 Connecting rod plate
16 Connecting rod

Figure 28. Cam assembly, exploded view.



EMC 4320-222-15/29

Figure 29. Pump drive assembly, exploded view.

1	Cover	13	Gasket	25	Clutch housing	37	Plug
2	Gasket	14	Oil Seal	26	Bolt (3 rqr)	38	Gasket
3	Cup	15	Bolt (3 rqr)	27	Washer (3 rqr)	39	Washer (3 rqr)
4	Cone and Rollers	16	Washer (3 rqr)	28	Gasket	40	Bolt (3 rqr)
5	Key	17	Cover	29	Cup	41	Cover
6	Camshaft	18	Cup	30	Worm gear	42	Bolt (7 rqr)
7	Bushing	19	Key	31	Screw (6 rqr)	43	Washer (7 rqr)
8	Nipple	20	Cone and Rollers	32	Washer (6 rqr)	44	Cover
9	Pin	21	Cover	33	Cam gear	45	Setscrew
10	Cap	22	Oil seal	34	Cone and Rollers	46	Washer (3 rqr)
11	Gearcase	23	Sleeve	35	Cup	47	Bolt (3 rqr)
12	Cone and Rollers	24	Setscrew	36	Gasket		

Figure 29—Continued.

e. Installation.

- (1) Position the key (7), cam housing ring (6), gasket (5), and cam (3) on the shaft (8). Adjust cam (3) on shaft so cam will extend $\frac{1}{16}$ of an inch over end of the shaft (8) and tighten setscrew (4).
- (2) Position cam housing (1) on cam (3) with cam ring (6) and gasket (5) in proper place. Secure with four screws (9) and washers (10).
- (3) Install the diaphragm (par. 80).
- (4) Install the drive cam oiler (2) on the cam housing (1).
- (5) Lubricate cam oiler in accordance with the current lubrication order.

82. Pump Bowl

a. Removal.

- (1) Remove the six screws (1, fig. 27) and washers (2) that secure the pump bowl (7) to the frame (10) and remove pump bowl with valves from the frame.
- (2) Remove the pump stands (par. 60).
- (3) Remove valves and valve body (par. 57 and 58).

b. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect the bowl for cracks, breaks, rust, and corrosion. Remove any rust and corrosion. Repair cracks and breaks or replace parts beyond repair.

c. Installation.

- (1) Install the pump stands (par. 60).
- (2) Install valves and valve body (par. 57 and 58).
- (3) Position the pump bowl (7) on the frame (10) and secure with six screws (1) and washers (2).

83. Pump Drive Assembly

a. Removal.

- (1) Remove the cam eccentric (par. 81).
- (2) Remove drain plug (7, fig. 15) from gearcase (6) and drain the oil into a suitable container.
- (3) Remove the six screws (31, fig. 29) and washers (32) from the gearcase (11) and frame (10, fig. 27) and remove pump drive assembly from the frame.

b. Disassembly.

- (1) Remove the three bolts (15, fig. 29) and washers (16) that secure the cover (17) to the gearcase (11). Remove the cover and gasket (13).
- (2) Remove the oil seal (14) from the cover (17).
- (3) Remove the three bolts (40) and washers (39) that secure the cover (41) to the cover (44). Remove the cover (41) and gasket (38).
- (4) Remove the seven bolts (42) and washers (43) that secure the cover (44) to the gearcase (11). Remove the cover and gasket (36).
- (5) Remove the bearing cup (35) from the cover (44).
- (6) Remove the camshaft (6) with cam gear (33) and cone and rollers (34) and (12) from the gearcase (11).
- (7) Remove the cone and rollers (34) and (12) from the camshaft (6).
- (8) Loosen the setscrew (45) and remove the cam gear (33) and the key (5) from the camshaft (6).
- (9) Loosen setscrew (24) and remove the clutch housing (25), key (19), and sleeve (23) from the worm gear (30).
- (10) Remove the three bolts (26) and washers (27) that secure the cover

- (21) to the gearcase (11). Remove the cover and gasket (28).
- (11) Remove the oil seal (22) from the cover (21).
- (12) Remove the three bolts (47) and washers (46) that secure the cover (1) to the gearcase (11). Remove the cover and gasket (2).
- (13) Place a wooden block against the shaft keyway end of the worm gear (30) and tap the wooden block lightly with a hammer until the bearing cup (3) and cone and rollers (4) are driven out of the gearcase (11). Remove the worm gear (30) with the cone and rollers (4) and (20) from the gearcase.
- (14) Remove the cone and rollers (4) and (20) from the shaft of the worm gear (30).
- (15) Remove the bearing cups (18) and (29) from the gearcase (11).
- (16) Remove the cotter pin (9) from cap (10) and remove the cap from the nipple (8). Remove the nipple from the bushing (7) and remove the bushing from gearcase (11).

c. Cleaning, Inspection, and Repair.

- (1) Clean all parts with an approved cleaning solvent and dry thoroughly.
- (2) Inspect oil seal lip for tears and cracks. Inspect bearings for damage to either races or rollers. Inspect gears to see that teeth are not damaged or stripped.
- (3) Replace gaskets and oil seals. Replace all defective parts.

d. Reassemble.

- (1) Install the bushing (7) in the top of the gearcase (11) and install the nipple (8) in the bushing (7). Position the cap (10) on the nipple (8) and secure with cotter pin (9).
- (2) Install the bearing cups (3) and (18) with cups facing inward in the gearcase (11).
- (3) Push the cone and rollers (4) and (20) on each end of worm gear (30) with the rollers facing ends of shaft. Check to see that cones and rollers are well against worm gear shoulders. Install the sleeve (23) on the drive end of the worm gear.

- (4) Position worm gear (30) in gearcase (11) with roller cones (4) against bearing cup (3) and hold in place by installing bearing cup (18) in gearcase against roller cones (20).
- (5) Position the cover (1) with 2 0.005 or 1 0.010 inch shim gasket (38) on gearcase (11) and secure with 3 bolts (42) and washers (43).

Note. Gaskets (2, 28, 13, and 38) serve as spacing shims. Caution must be taken to adjust bearings so that there will be at least 0.005 inch end play in worm gear (30) and camshaft (6). A tight adjustment will cause bearings to heat and bind.

- (6) Install the oil seal (22) in the cover (21).
- (7) Position the cover (21) with 2 0.005 or 1 0.010 inch shim gasket (28) on gearcase (11) and secure with 3 bolts (26) and washers (27). Care should be taken when sliding on cover (21) not to damage seal. Place oil on shaft to ease sliding of seal.
- (8) Install the sleeve (23), key (19), and clutch housing (25) on the shaft of the worm gear (30) and tighten setscrew (24).
- (9) Assemble the cam gear (33) onto the camshaft (6) by placing key (5) in keyway and pushing cam gear on shaft so that longest part of hub (side with setscrew) is $1\frac{1}{8}$ inch from end of shaft and secure by tightening setscrew (45).
- (10) Push the cone and rollers (12 and 34) on camshaft (6) with the rollers facing ends of shaft. Push cone and rollers snug against cam gear.
- (11) Position assembled camshaft in gearcase (11) with exposed keyway on end of shaft in first.
- (12) Push the bearing cup (35) into cover (44) with cup facing flat side of cover.
- (13) Position the cover (44) and gasket (36) on the gearcase (11) and secure with seven bolts (42) and washers (43).
- (14) Position the cover (41) with 2 0.005 or 1 0.010 inch shim gasket (38) on the gearcase (11) and secure with 3 bolts (42) and washers (43).

(15) Install the oil seal (14) in the cover (17).

(16) Position the cover (17) with 2 0.005 or 1 0.010 inch shim gasket (13) on the gearcase (11) and secure with 3 bolts (15) and washers (16). Care should be taken when sliding on cover (17) not to damage seal. Place oil on shaft to ease sliding of seal on shaft.

e. Installation.

(1) Position pump drive assembly on the frame (10, fig. 27) and secure to the frame with 6 washers (32, fig. 29) and 6 screws (31).

(2) Install cam eccentric (par. 81).

(3) Install drain plug (7, fig. 15) in gear reduction case (6) and fill with lubricant in accordance with the current lubrication order.

84. Frame

a. Removal.

(1) Remove engine (par. 45).

(2) Remove the diaphragm (par. 80).

(3) Remove wheels (par. 53).

(4) Remove handle (par. 52).

(5) Remove pump drive assembly (par. 83).

b. Cleaning, Inspection, and Repair.

(1) Clean frame with an approved cleaning solvent and dry thoroughly.

(2) Inspect frame for breaks and cracks. Repair or replace a defective frame.

c. Installation.

(1) Install wheels (par. 53).

(2) Install pump drive assembly (par. 83).

(3) Install the diaphragm (par. 80).

(4) Install handle (par. 52).

(5) Install engine (par. 45).

APPENDIX I

REFERENCES

1. Dictionaries of Terms and Abbreviations

- AR 320-5 Dictionary of United States Army Terms.
AR 320-50 Authorized Abbreviations and Brevity Codes.

2. Fire Protection

- TM 5-687 Repairs and Utilities; Fire Protection Equipment and Appliances; Inspections, Operations, and Preventive Maintenance.
TM 9-1799 Ordnance Maintenance: Fire Extinguishers.

3. Lubrication

- LO 5-4320-222-15 Pump, Reciprocating: Diaphragm; Gasoline Driven; Wheel Mounted, Rubber Tires; 4 In.; 100 Gpm at 10 Ft Suction Lift (Rice Pump and Machine Co Model 4D-327) W/Military Standard Engine Model 2A016-2.
LO 5-2805-206-14 Engine, Gasoline (Military Standard Models) (Model 1A08-1) 1½ Hp, FSN 2805-601-5181; (Model 1A08-2) 1½ Hp, FSN 2805-714-8552 (Model 2A016-1) 3 Hp, FSN 2805-601-5127 (Model 2A016-2) 3 Hp, FSN 2805-714-8553.

4. Operator, Organizational, Field and Depot Maintenance

- TM 5-4320-222-15 Operator, Organizational, Field and Depot Maintenance Manual; Pump, Reciprocating: Diaphragm; Gasoline Driven; Wheel Mounted, Rubber Tires; 4 In.; 100 Gpm at 10 Ft Suction Lift (Rice Pump and Machine Co Model 4D-327) Serial Number Range 1120 thru 1245 Less Mil Std Engine, FSN 4320-829-8434.
TM 5-2805-206-14 Operator, Organizational, and Field Maintenance Manual; Engine, Gasoline (Military Standard Models) (Model 1A08-1) 1½ Hp, FSN 2805-601-5181; (Model 1A08-2) 1½ Hp, FSN 2805-714-8552 (Model 2A016-1) 3 Hp, FSN 2805-601-5127 (Model 2A016-2) 3 Hp, FSN 2805-714-8553.

5. Painting

- TB ENG 60 Preservation and Painting of Serviceable Corps of Engineers Equipment.
TM 9-2851 Painting Instructions for Field Use.

6. Preventive Maintenance

- AR 700-38 Unsatisfactory Equipment Report.
AR 750-5 Maintenance Responsibilities and Shop Operation.
TM 5-505 Maintenance of Engineer Equipment.

7. Publication Indexes

- DA Pam 108-1 Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings.
DA Pam 310-1 Index of Administrative Publications.
DA Pam 310-2 Index of Blank Forms.
DA Pam 310-3 Index of Training Publications.
DA Pam 310-4 Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
DA Pam 310-5 Index of Graphic Training Aids and Devices.
DA Pam 310-25 Index of Supply Manuals—Corps of Engineers.

8. Shipment and Limited Storage

AR 743-505 Limited Storage of Engineers Mechanical Equipment.
TM 9-200 General Packaging Instructions for Ordnance General Supplies.
TM 38-230 Preservation, Packaging, and Packing of Military Supplies and Equipment.

9. Supply Publications

SM 10-1-C4-1 Petroleum, Petroleum-Base Products, and Related Material.
TM 5-4320-222-25P Organizational, Field and Depot Maintenance Repair Parts and Special Tool Lists; Pump, Reciprocating: Diaphragm; Gasoline Driven; Wheel Mounted, Rubber Tires; 4 In.; 100 Gpm at 10 Ft Suction Lift (Rice Pump and Machine Co Model 4D-327) Serial Number Range 1120 thru 1245, FSN 4320-829-8434.
TM 5-2805-206-14P Operator, Organizational, and Field Maintenance Repair Parts and Special Tool Lists; Engine, Gasoline (Military Standard Models) (Model 1A08-11) 1½ Hp, FSN 2805-601-5181, (Model 1A08-2) 1½ Hp, FSN 2805-714-8552, (Model 2A016-1) 3 Hp, FSN 2805-601-5127, (Model 2A016-2) 3 Hp, FSN 2805-714-8553.

10. Training Aids

FM 5-25 Explosives and Demolition.
FM 21-5 Military Training.
FM 21-6 Techniques of Military Instruction.
FM 21-30 Military Symbols.

APPENDIX II

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

1. General

This appendix contains a Maintenance Allocation Chart listing all maintenance and repair operations authorized for the various echelons.

2. Maintenance

Maintenance is any action taken to keep material in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of material includes the following:

a. Service. To clean, to preserve, and to replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and to detect incipient mechanical failure by scrutiny.

d. Test. To verify serviceability and to detect incipient mechanical failure by use of special equipment such as gages, meters, and so on.

e. Replace. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

f. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

g. Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of Inspect and Repair Only as Necessary (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the term during the overhaul process.

3. Explaining of Columns

a. Functional Group. The functional group is a numerical setup on a functional basis. The applicable functional grouping indexes are taken from the Corps of Engineers Functional Grouping Indexes, and appear on the Maintenance

Allocation Chart in their correct numerical sequence. These indexes are normally set up according to their proximity to each other and their function.

b. Components and Related Operation. This column contains the functional index grouping heading, subgroup headings, and a brief description of the part starting with the noun name. It also designates the operation to be performed such as service, adjust, inspect, test, replace, repair, and overhaul.

c. Echelon Maintenance.

- (1) *First echelon.* First echelon maintenance is that maintenance performed by the user or operator of the equipment, such as servicing, cleaning, lubricating, and limited adjustments. It also includes removal and replacement of items to accomplish servicing and lubricating.
- (2) *Second echelon.* Second echelon maintenance is that maintenance performed by trained personnel provided for the purpose in the using organization, such as replacement of all items in column 2, limited parts fabrication from bulk material, adjustments, and repair of assemblies, components, and end items that can be accomplished without extensive disassembly.
- (3) *Third echelon.* Third echelon maintenance is that maintenance performed by specially trained units in direct support of the using organization, such as replacement of all items in columns 2 and 3, repair assemblies, components, and end items, and fabricate parts from bulk material.
- (4) *Fourth echelon.* Fourth echelon maintenance is that maintenance performed by units organized as semi-fixed or permanent shops to serve lower echelon maintenance within a geographical area, such as replacement of items in columns 2, 3, and 4, repair end items, overhaul assemblies,

components, and fabricate general use common hardware and parts.

- (5) *Fifth echelon.* Fifth echelon maintenance is that maintenance authorized to overhaul assemblies, components, end items and replacement of all parts in column 2, 3, 4, and 5.

d. Symbol X. The symbol X placed in the appropriate column indicates the lowest echelon

responsible for performing that particular maintenance operation, but does not necessarily indicate repair parts will be stocked at that level.

e. Remarks. The remark column is used to explain why maintenance, that would normally be done at a lower echelon, is moved to a higher echelon because of some peculiarity in the construction of the end item.

Section II. MAINTENANCE ALLOCATION CHARTS

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
01	ENGINE						
0100	Engine Assembly						
	Engine, gasoline:						
	Inspect.....	X					TM 5-2805-206-14
	Test.....		X				TM 5-2805-206-14
	Replace.....		X				
	Repair.....		X				TM 5-2805-206-14
	Overhaul.....					X	Designated Depot Maint. Shops (Engr. Only).
02	CLUTCH						
0200	Clutch Assembly						
	Coupling, clutch:						
	Replace.....		X				
	Repair.....		X				
0201	Clutch Disks and Plates:						
	Segment, clutch:						
	Replace.....		X				
	Spring:						
	Replace.....		X				
03	FUEL SYSTEM						
0306	Tanks, Lines, Fittings:						
	Hose assembly, fuel:						
	Replace.....		X				
	Tank, gasoline:						
	Service.....		X				
	Cap, fuel tank:						
	Replace.....		X				
11	REAR AXLE						
1101	Housing, Beam. Housing Covers, Plugs:						
	Axle:						
	Replace.....		X				
13	WHEELS AND TRACKS						
1311	Wheel Assembly:						
	Wheel:			X			
	Service.....			X			
	Replace.....						
15	FRAME						
1501	Frame Assembly						
	Frame, pump mounting:				X		
	Repair.....						
1507	Landing Gear; Leveling Jacks						
	Stand, pump support:						
	Adjust.....	X					

Functional group	Components and related operation	Echelons of maintenance					Remarks
		1	2	3	4	5	
22	MISCELLANEOUS BODY, CHASSIS OR HULL, AND ACCESSORY ITEMS						
2210	Data Plates and Instruction Holders						
	Plate (C.O.E.):						
	Replace.....			X			
55	PUMPS (EXCLUDE ENGINE PUMPS)						
5500	Pump Assembly						
	Pump assembly:						
	Inspect.....	X					
	Service.....	X					
	Replace.....			X			
	Repair.....			X			
	Overhaul.....				X		
5501	Volute, Housing						
	Bowl, pump:						
	Replace.....			X			
5502	Impeller; Rotor, Diaphragm						
	Diaphragm, pump:						
	Replace.....			X			
5504.1	Discharge Valve						
	Body, valve:						
	Service.....	X					
	Gasket, valve and seat:						
	Replace.....		X				
	Gasket, clean out cover:						
	Replace.....		X				
5504.2	Suction Valve, Suction Heads						
	Body, valve:						
	Service.....	X					
	Gasket, valve and seat:						
	Replace.....		X				
5505	Lubricator						
	Oiler, cam drive:						
	Service.....	X					
	Replace.....		X				
5508.2	Pump Drive Assembly						
	Drive assembly, pump:						
	Service.....	X					
	Replace.....			X			
	Repair.....			X			
	Cup, cone and Rollers, tapered roller bearing:						
	Replace.....			X			
	Seal:						
	Replace.....			X			
5510	Shafts, Crankshafts						
	Cam assembly, diaphragm drive:						
	Replace.....			X			
	Bearing, cam:						
	Replace.....			X			
	Connecting rod assembly:						
	Replace.....			X			
76	FIREFIGHTING EQUIPMENT						
7603	Fire Extinguishers						
	Extinguisher, fire:						
	Replace.....	X					

APPENDIX III

BASIC ISSUE ITEMS

Section I. INTRODUCTION

1. General

Section II lists the accessories, tools, and publications required in 1st echelon maintenance and operation, initially issued with, or authorized for the Reciprocating Pump.

2. Explanation of Columns

a. *Source Codes.* The information provided in each column is as follows:

- (1) *Technical service.* This column lists the basic number (or symbol) of the technical service assigned supply responsibility for the part. These blank spaces denote Corps of Engineers supply responsibility. General Engineer supply parts are identified by the letters "GE" in parentheses, following the nomenclature in the description column. Other technical services basic numbers (or symbols) are:
10—Quartermaster
12—Adjutant General
- (2) *Source.* The selection status and source of supply for each part are indicated by one of the following code symbols:
 - (a) P—applied to repair parts which are high mortality parts; procured by technical services, stocked in and supplied from the technical service depot system; and authorized for use at indicated maintenance echelons.
 - (b) P1—applied to repair parts which are low mortality parts; procured by technical services, stocked only in and supplied from technical service key depots, and authorized for installation at indicated maintenance echelons.
 - (c) M—applied to repair parts which are not procured or stocked but are to be manufactured by using units at indicated maintenance echelons.
- (3) *Maintenance.* The lowest maintenance echelon authorized to use, stock, install

or manufacture the part is indicated by the following code symbol:

0—Organizational Maintenance
(1st and 2d Echelon)

b. *Federal Stock Numbers.* This column lists the 11-digit Federal stock number used for requisitioning purposes.

c. *Description.*

- (1) The item name and a brief description of the part are shown.
- (2) A five-digit Federal supply code for manufacturers and/or other technical services is shown in parentheses followed by the manufacturer's part number. This number shall be used for requisitioning purposes when no Federal stock number is indicated.
Example: (08645) 86453
- (3) The letters "GE", shown in parentheses immediately following the description, indicate General Engineer supply responsibility for the part.

d. *Unit of Issue.* Where no abbreviation is shown in this column, the unit of issue is "each".

e. *Expendability.* Those items classified as nonexpendable are indicated by letters "NX". Items not indicated by "NX" are expendable.

f. *Quantity Authorized.* This column lists the quantities of repair parts, accessories, tools, or publications authorized for issue to the equipment operator or crew as required.

g. *Quantity Issued with Equipment.* This column lists the quantities of repair parts, accessories, tools, or publications that are initially issued with each item of equipment. Those indicated by an asterisk are to be requisitioned through normal supply channels as required.

h. *Illustrations.*

- (1) *Figure number.* Provides the identifying number of the illustration.
- (2) *Item number.* Provides the referenced number for the part shown in the illustration.

3. Comments and Suggestions

Suggestions and recommendations for changes to the Basic Issue Items List shall be submitted on DA Form 2028 to the Command-

ing Officer, U. S. Army Engineer Maintenance Center, Corps of Engineers, ATTN: EMCDM-S, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

Section II. BASIC ISSUE ITEMS LIST

Source codes				Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Quantity issue with equipment	Illustrations	
Technical service	Source	Maintenance	Recoverability							Fig.	Item
					GROUP 01—ENGINE						
					0111.1—HAND CRANKING DEVICES						
10	M	O	-----		ROPE ASSEMBLY: starting (81336) ERO-2520.			1	1		
	P	O	-----	4020-240-2146	Manufacture from: CORD, NYLON: (3 ft required).	FT.					
					GROUP 26—ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT AND TOOLS						
					2602.1—ACCESSORIES						
10	P	O	-----	7520-559-9618	CASE, MAINTENANCE AND OPERATIONAL MANUAL: cotton duck, water repellent and mildew resistant.			1	1		
	P	O	-----	4740-202-8653	HOSE ASSEMBLY W/COUPLINGS: 4 in. id, 10 ft lg.			4	4		
					2602.2—COMMON TOOLS						
10	P	O	-----	5120-449-8083	WRENCH: Open end adjustable, 10 in.			1	*		
10	P	O	-----	5120-227-7356	SCREWDRIVER: common, 6 in. blade.			1	*		
10	P	O	-----	5120-223-7396	Pliers: combination, slip joint w/cutter.			1	*		
					2602.4—PUBLICATIONS						
12			-----		DEPARTMENT OF THE ARMY TECHNICAL MANUAL TM 5-2805-205-14.			2	2		
12			-----		DEPARTMENT OF THE ARMY TECHNICAL MANUAL TM 5-2805-206-14P.			2	2		
12			-----		DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5-2805-206-14.			1	1		
12			-----		DEPARTMENT OF THE ARMY ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE MANUAL TM 5-4320-222-15.			2	2		

Source codes				Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Quantity issue with equipment	Illustrations	
Technical service	Source	Maintenance	Recoverability							Fig.	Item
12					DEPARTMENT OF THE ARMY ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS TM 5-4320-222-25P.			2	2		
12					DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5-4320-222-15.			1	1		
					GROUP 76—FIREFIGHTING EQUIPMENT						
					7603—FIRE EXTINGUISHERS						
	P1	O		4210-893-1092	EXTINGUISHER, FIRE, DRY POWDER (GE).			1	1		

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BY ORDER OF THE SECRETARY OF THE ARMY:

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For explanation of abbreviations used, see AR 320-50.